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Dkt No 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al*, Tel 202/371-2600
Title Applications of Universal Frequency Translation

10086250 .053102 #3

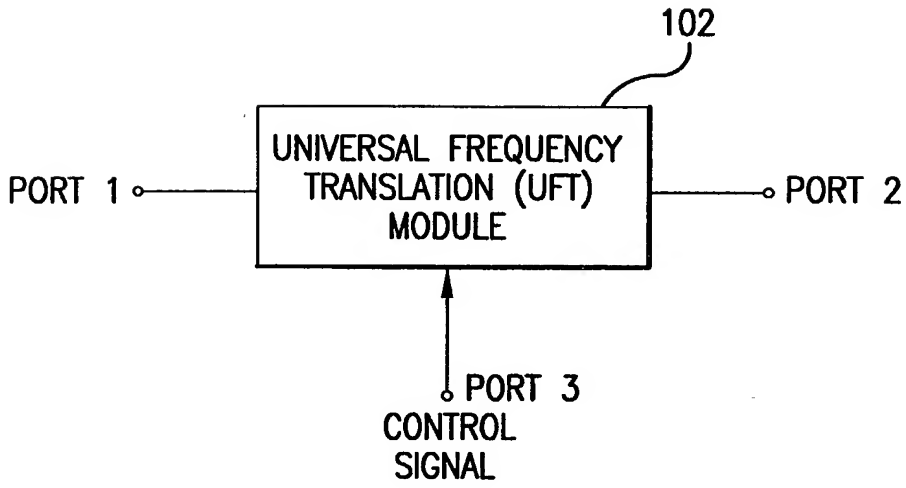

FIG. 1A

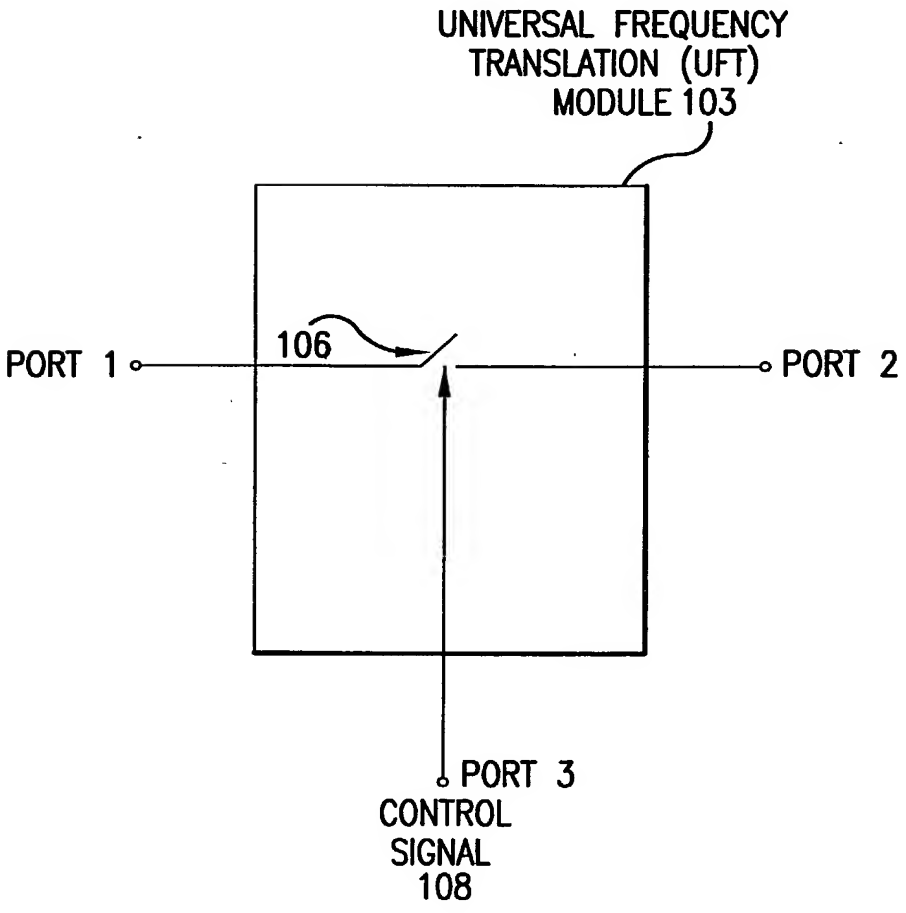

FIG. 1B

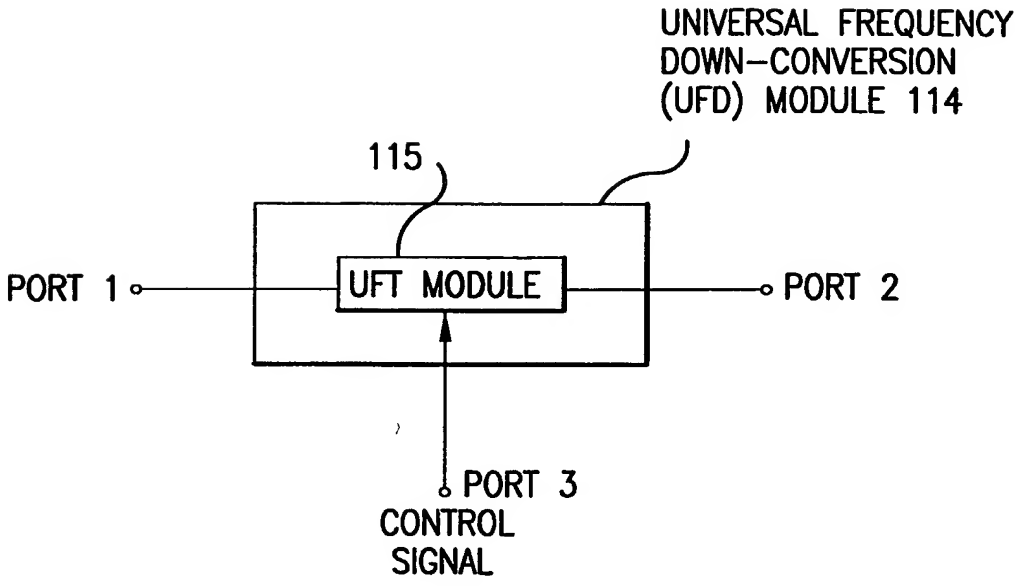
UNIVERSAL FREQUENCY
DOWN-CONVERSION
(UFD) MODULE 114
115
PORT 1
UFT MODULE
PORT 2
PORT 3
CONTROL
SIGNAL

FIG. 1C

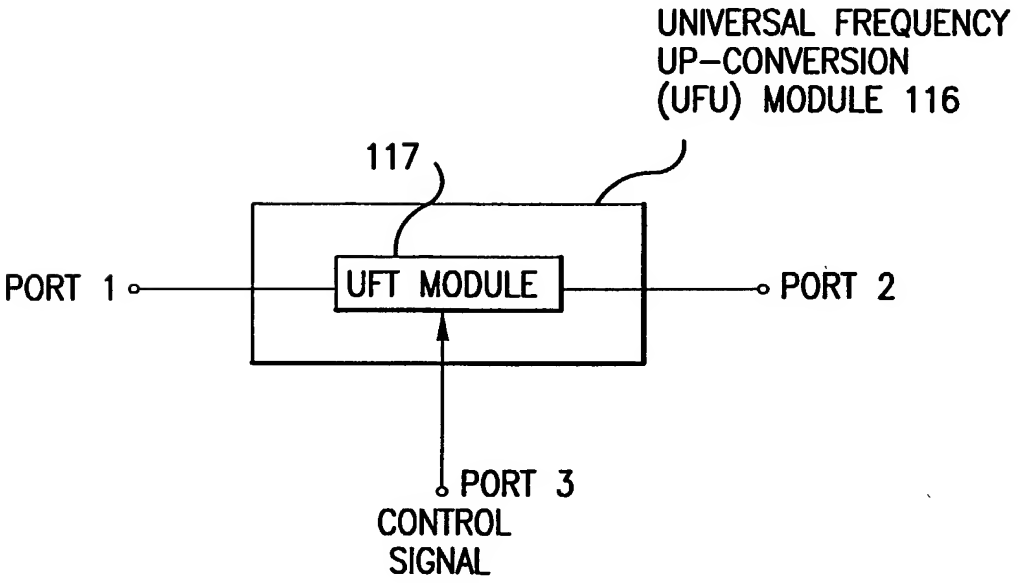
UNIVERSAL FREQUENCY
UP-CONVERSION
(UFU) MODULE 116
117
PORT 1
UFT MODULE
PORT 2
PORT 3
CONTROL
SIGNAL

FIG. 1D

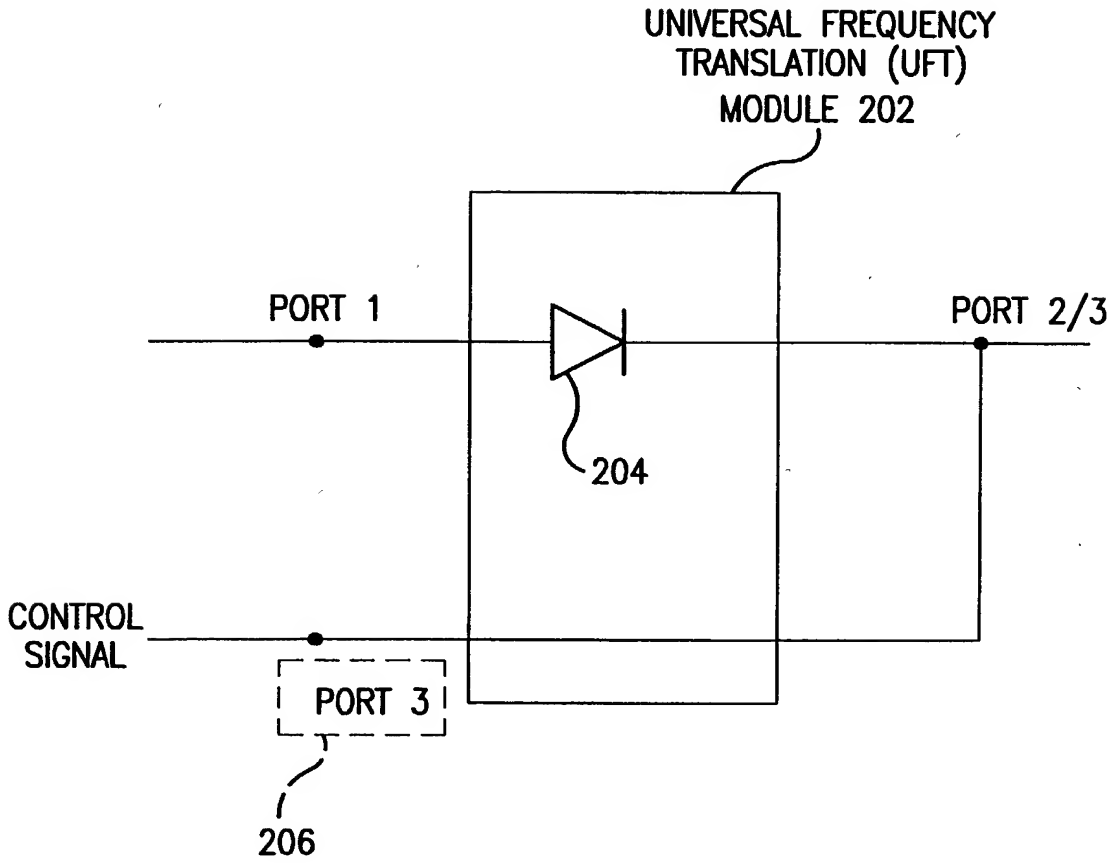
UNIVERSAL FREQUENCY
TRANSLATION (UFT)
MODULE 202
PORT 1
PORT 2/3
204
CONTROL
SIGNAL
PORT 3
206

FIG. 2

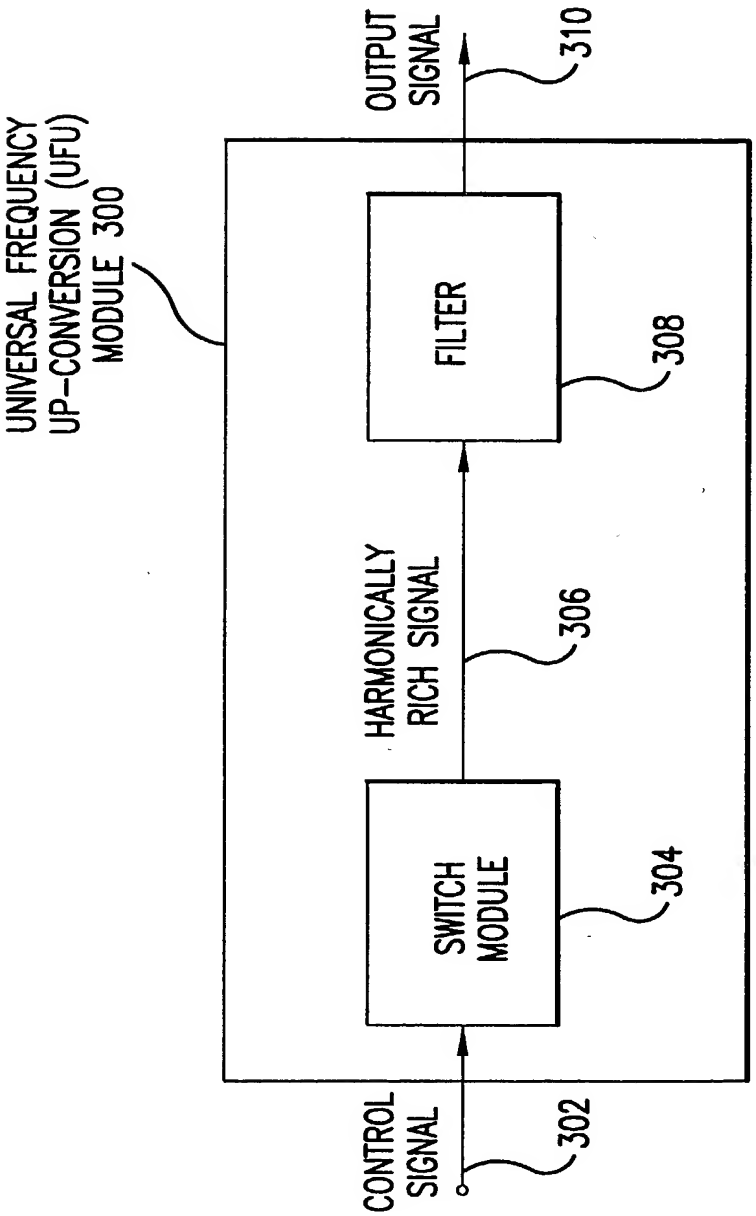
UNIVERSAL FREQUENCY
UP-CONVERSION (UFU)
MODULE 300
OUTPUT
SIGNAL
310
FILTER
308
HARMONICALLY
RICH SIGNAL
306
SWITCH
MODULE
304
CONTROL
SIGNAL
302

FIG. 3

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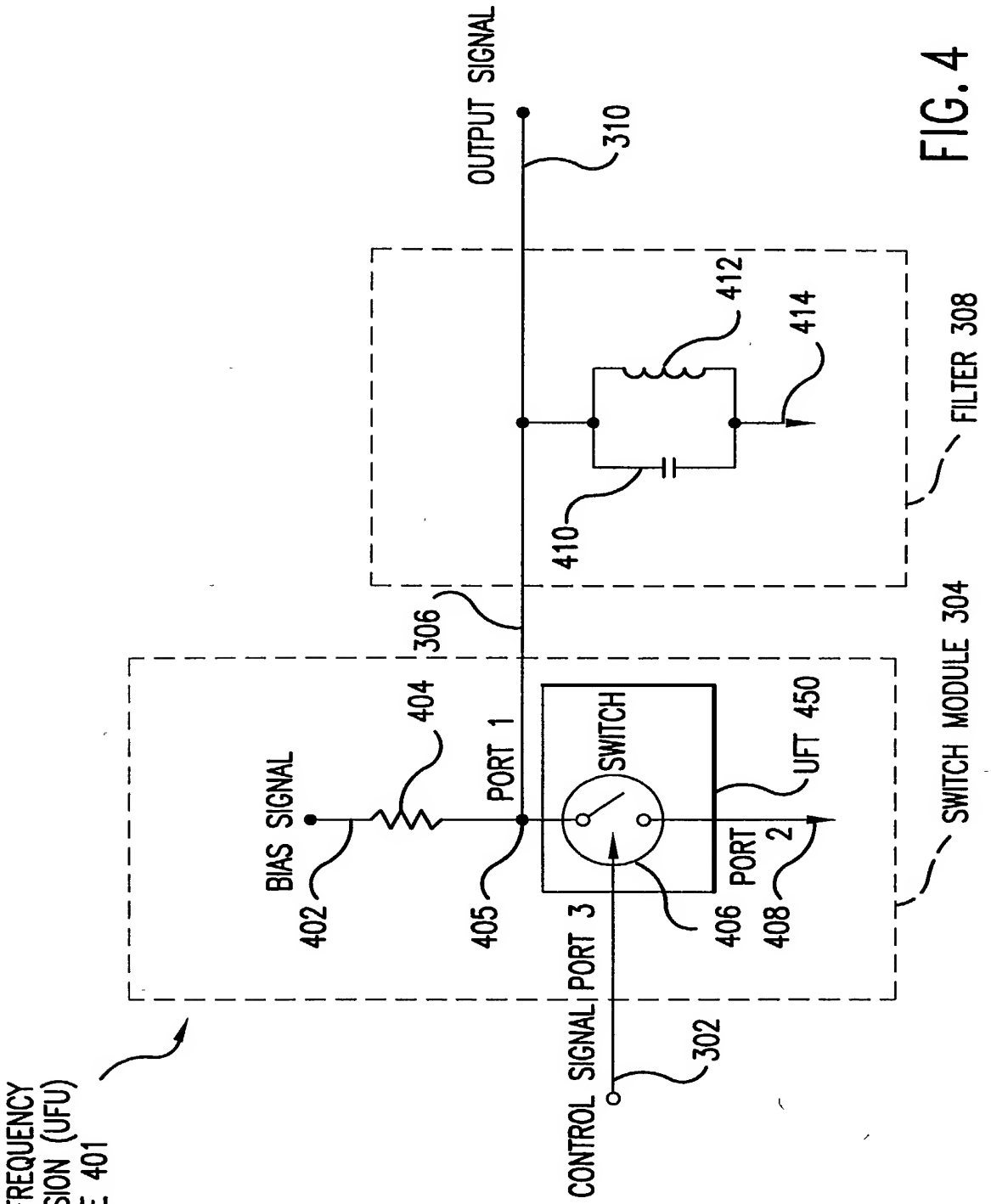

FIG. 4

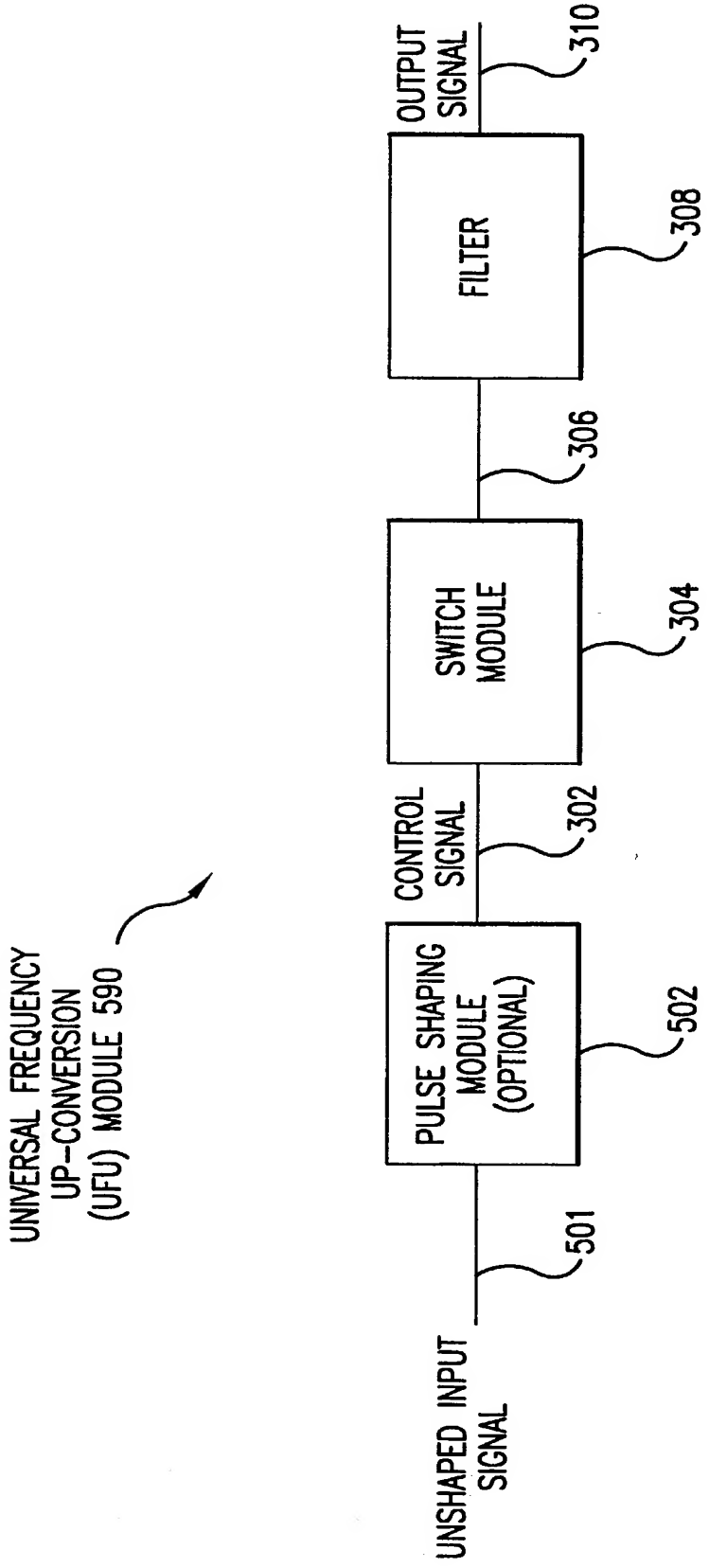
UNIVERSAL FREQUENCY UP-CONVERSION (UFU) MODULE 590
UNSHAPED INPUT SIGNAL
501
PULSE SHAPING MODULE (OPTIONAL)
502
CONTROL SIGNAL
302
SWITCH MODULE
304
306
FILTER
308
OUTPUT SIGNAL
310

FIG. 5

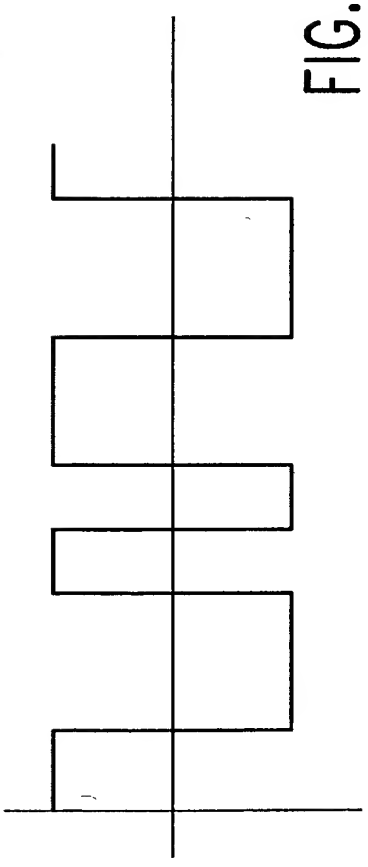

FIG. 6A

INFORMATION SIGNAL 602

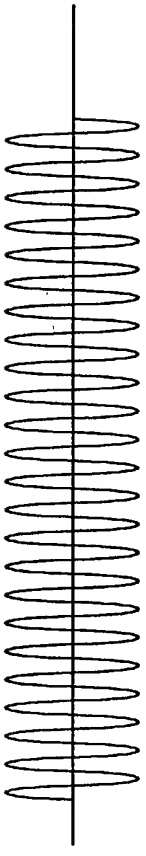

FIG. 6B

OSCILLATING SIGNAL 604

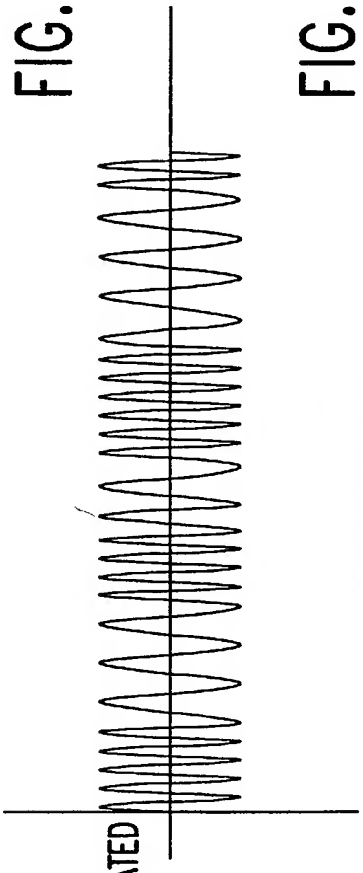

FIG. 6C

FREQUENCY MODULATED INPUT SIGNAL 606

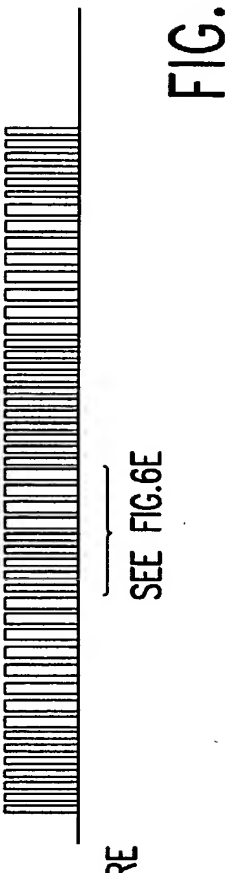

FIG. 6D

HARMONICALLY RICH SIGNAL (SHOWN AS SQUARE WAVE) 608

SEE FIG.6E

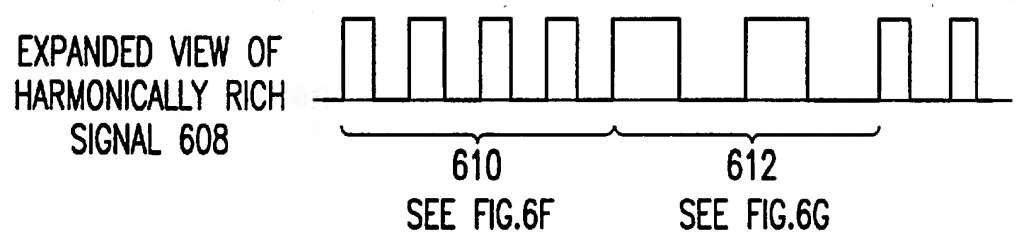

FIG. 6E

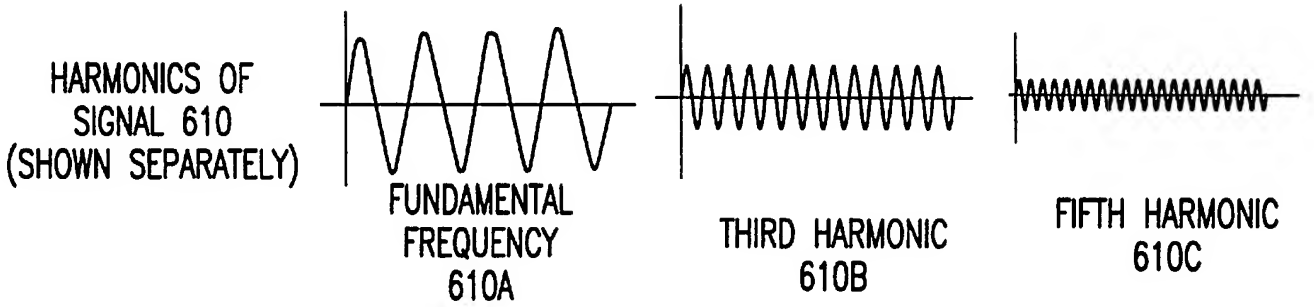

FIG. 6F

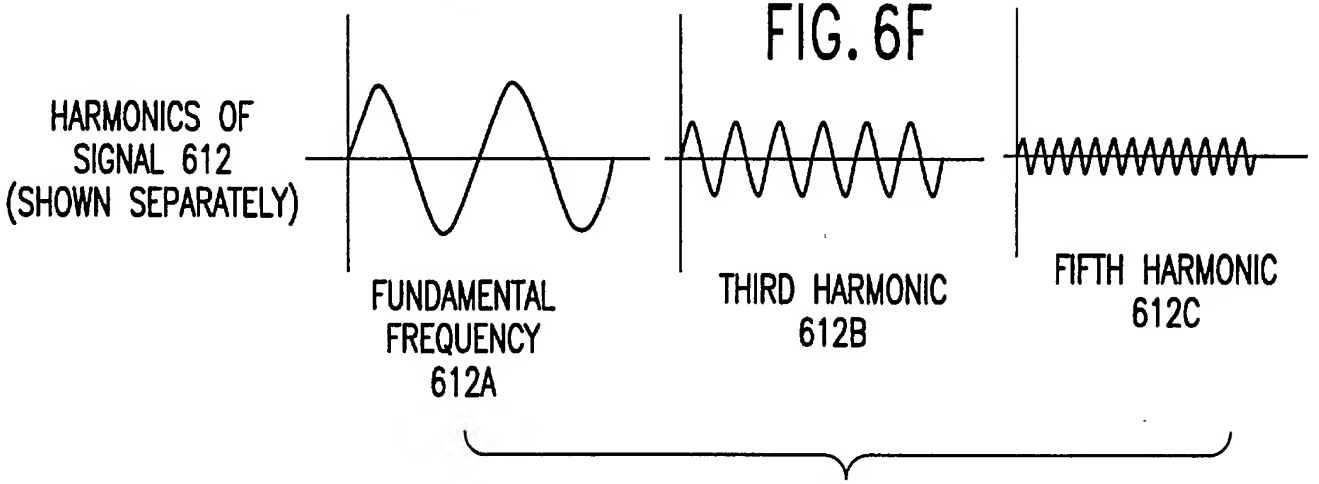

FIG. 6G

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Title Applications of Universal Frequency Translation

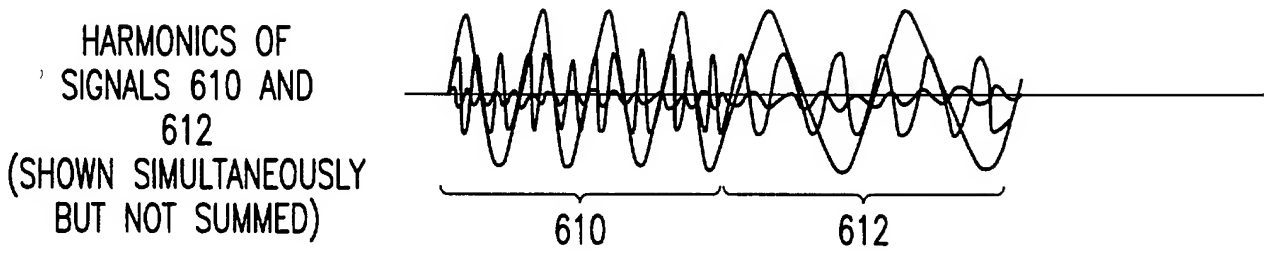

FIG. 6H

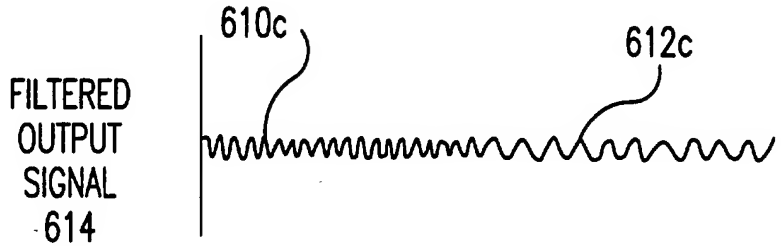

FIG. 6I

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Inventors Sorrells *et al*, Tel 202/371-2600
Title Applications of Universal Frequency Translation

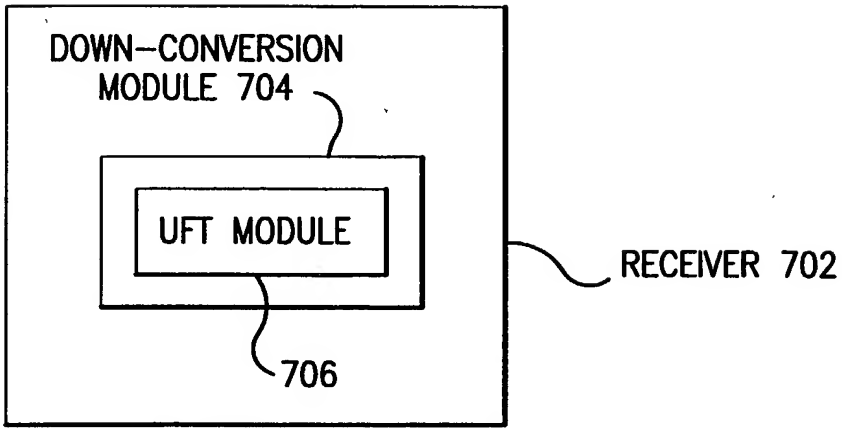
DOWN-CONVERSION
MODULE 704
UFT MODULE
706
RECEIVER 702

FIG. 7

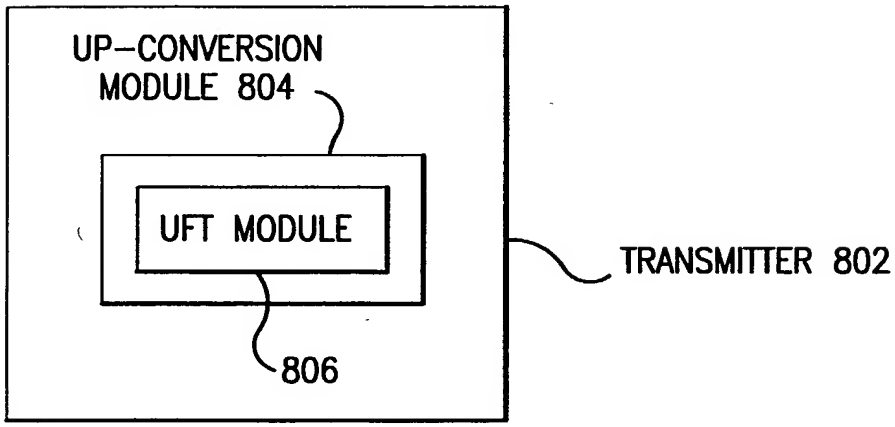
UP-CONVERSION
MODULE 804
UFT MODULE
806
TRANSMITTER 802

FIG. 8

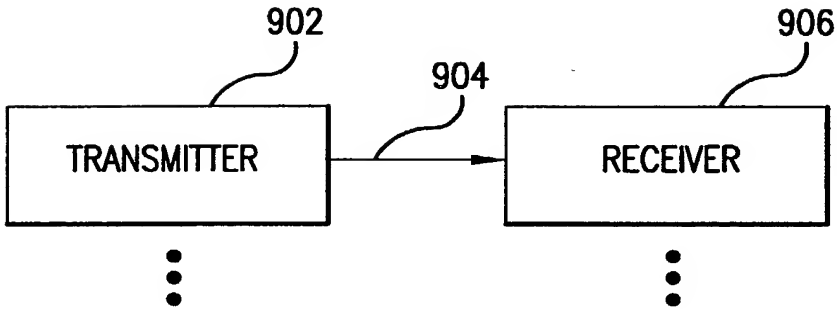
902
904
906
TRANSMITTER
RECEIVER

FIG. 9

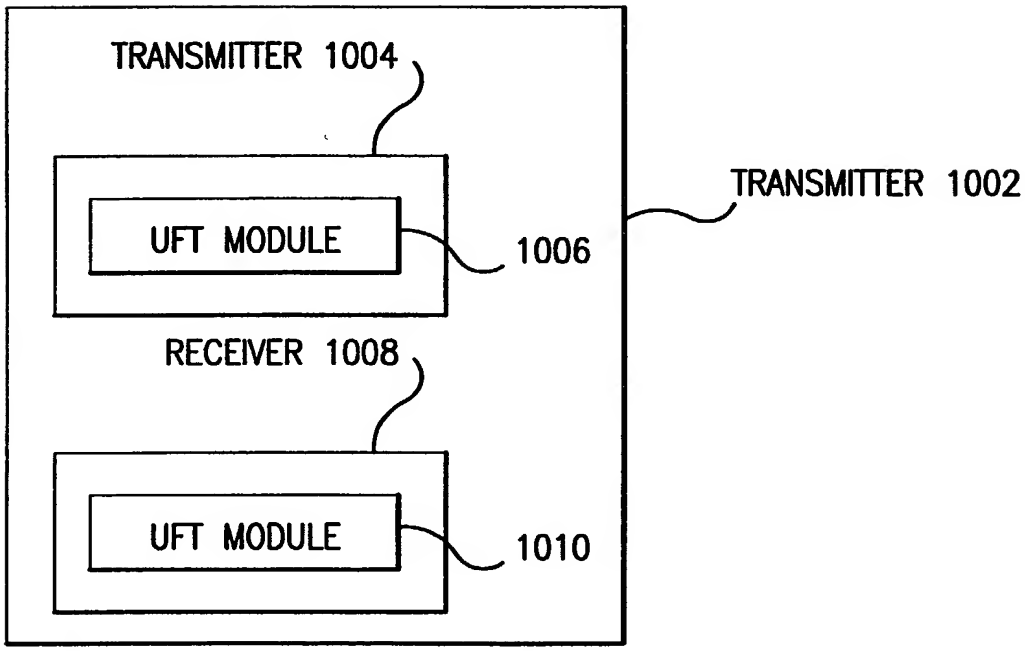
TRANSMITTER 1004
UFT MODULE
1006
TRANSMITTER 1002
RECEIVER 1008
UFT MODULE
1010

FIG. 10

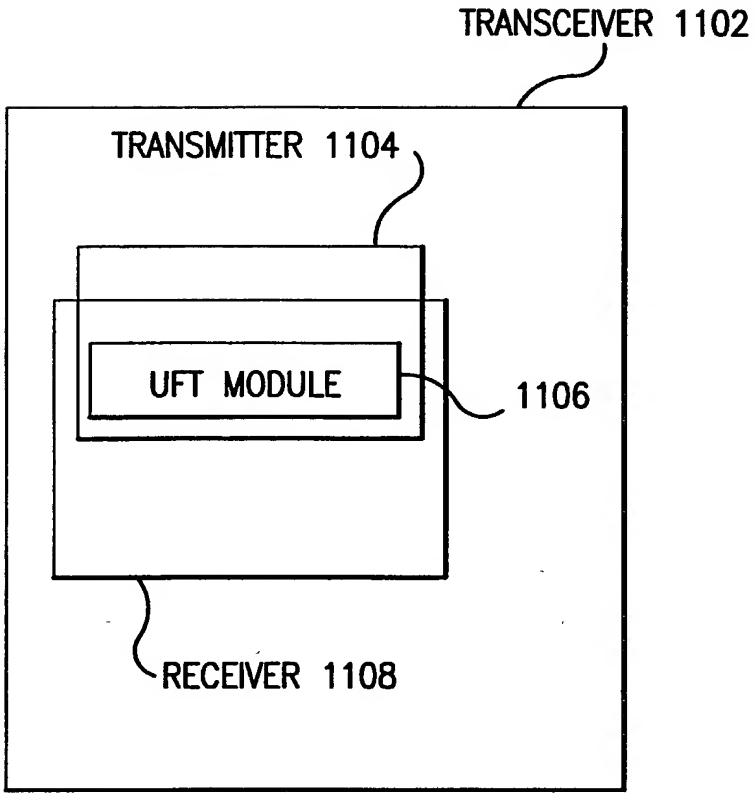
TRANSCEIVER 1102
TRANSMITTER 1104
UFT MODULE
1106
RECEIVER 1108

FIG. 11

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Title Applications of Universal Frequency Translation

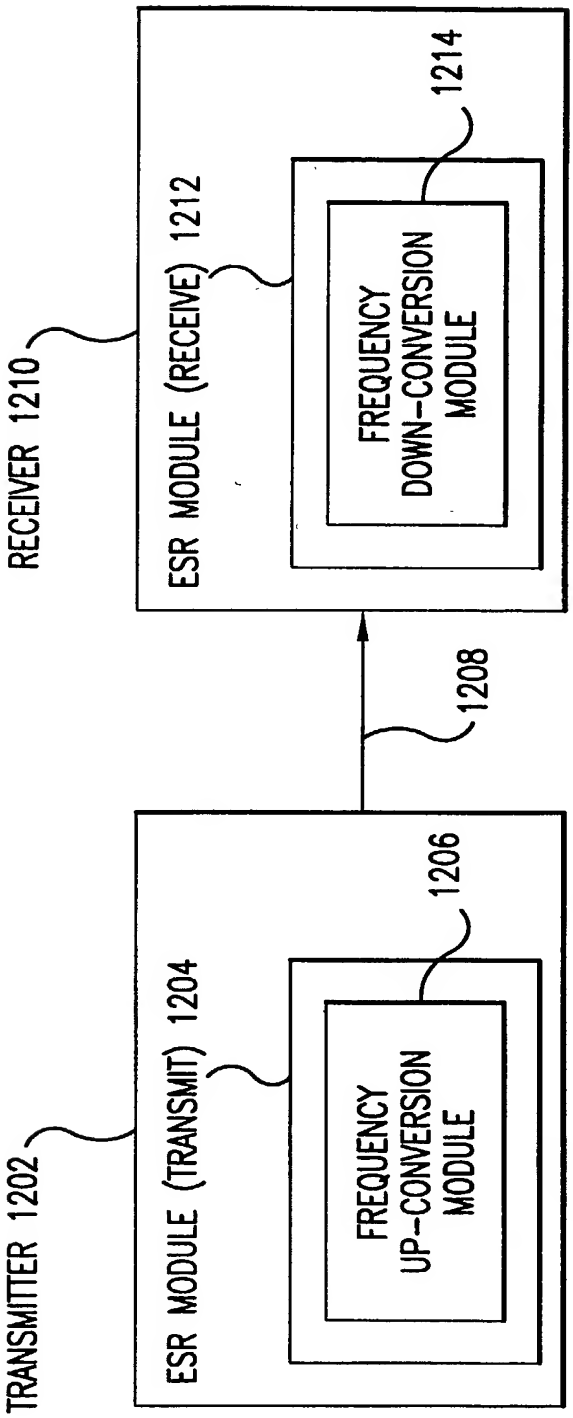

FIG. 12

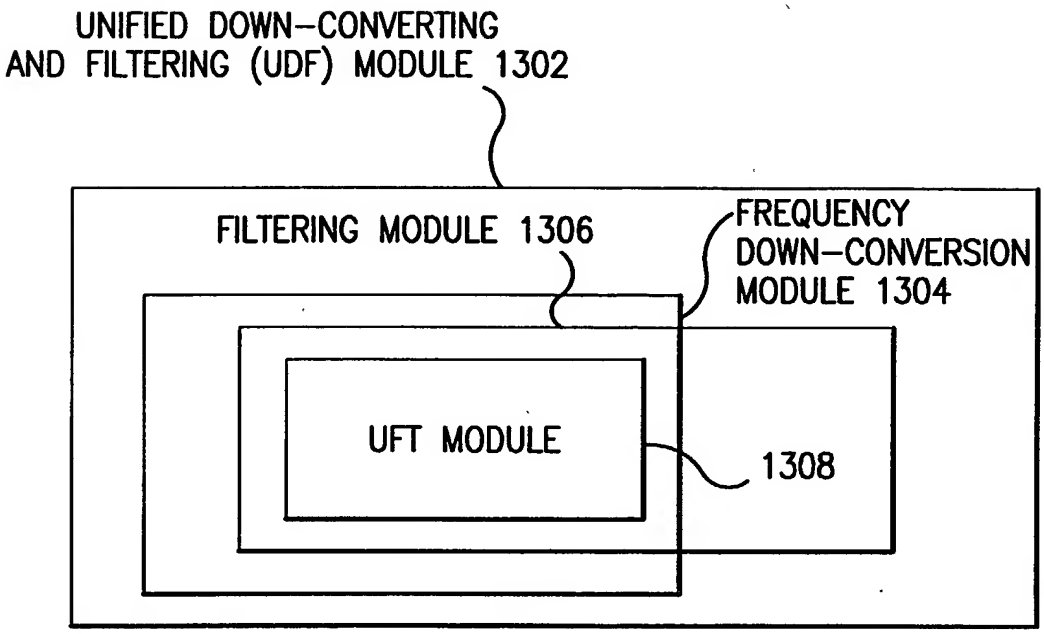
UNIFIED DOWN-CONVERTING
AND FILTERING (UDF) MODULE 1302
FILTERING MODULE 1306
FREQUENCY
DOWN-CONVERSION
MODULE 1304
UFT MODULE
1308

FIG. 13

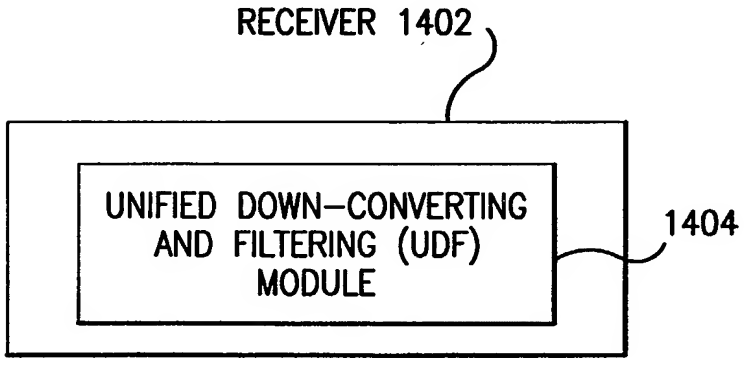
RECEIVER 1402
UNIFIED DOWN-CONVERTING
AND FILTERING (UDF)
MODULE
1404

FIG. 14

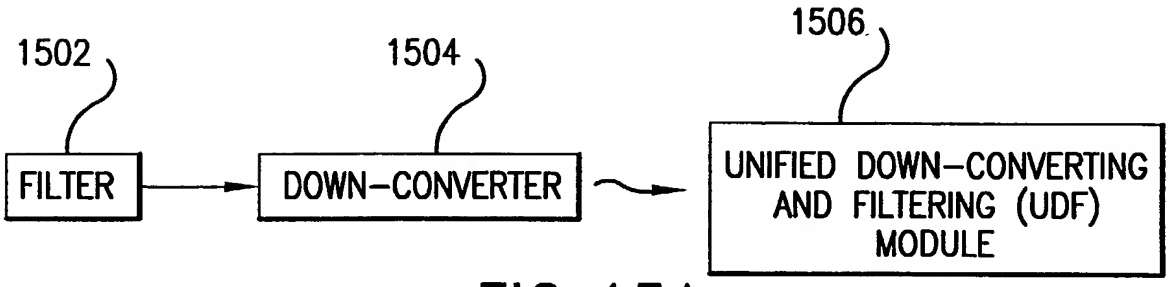

FIG. 15A

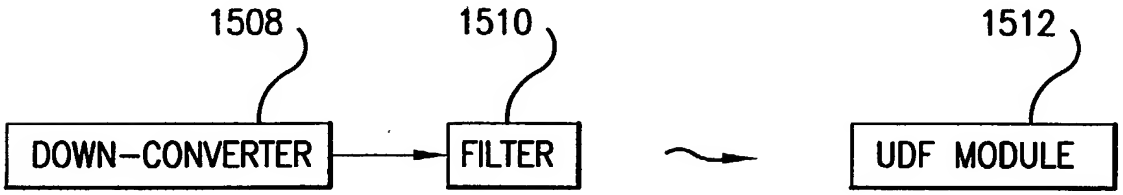

FIG. 15B

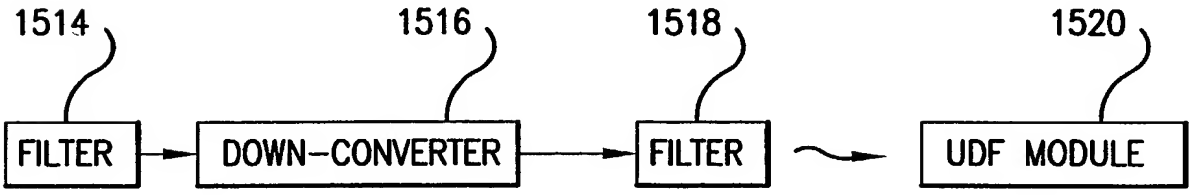

FIG. 15C

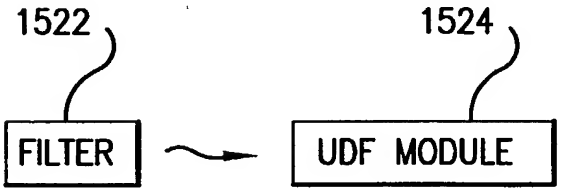

FIG. 15D

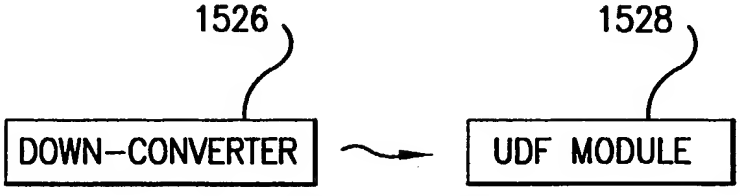

FIG. 15E

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Inventors Sorrells *et al* , Tel 202/371-2600
Title Applications of Universal Frequency Translation

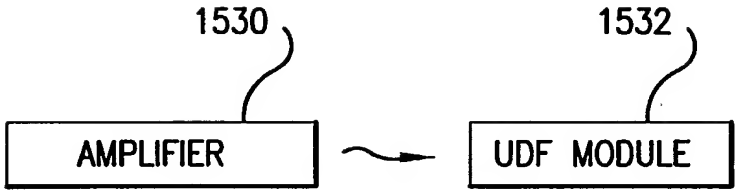

FIG. 15F

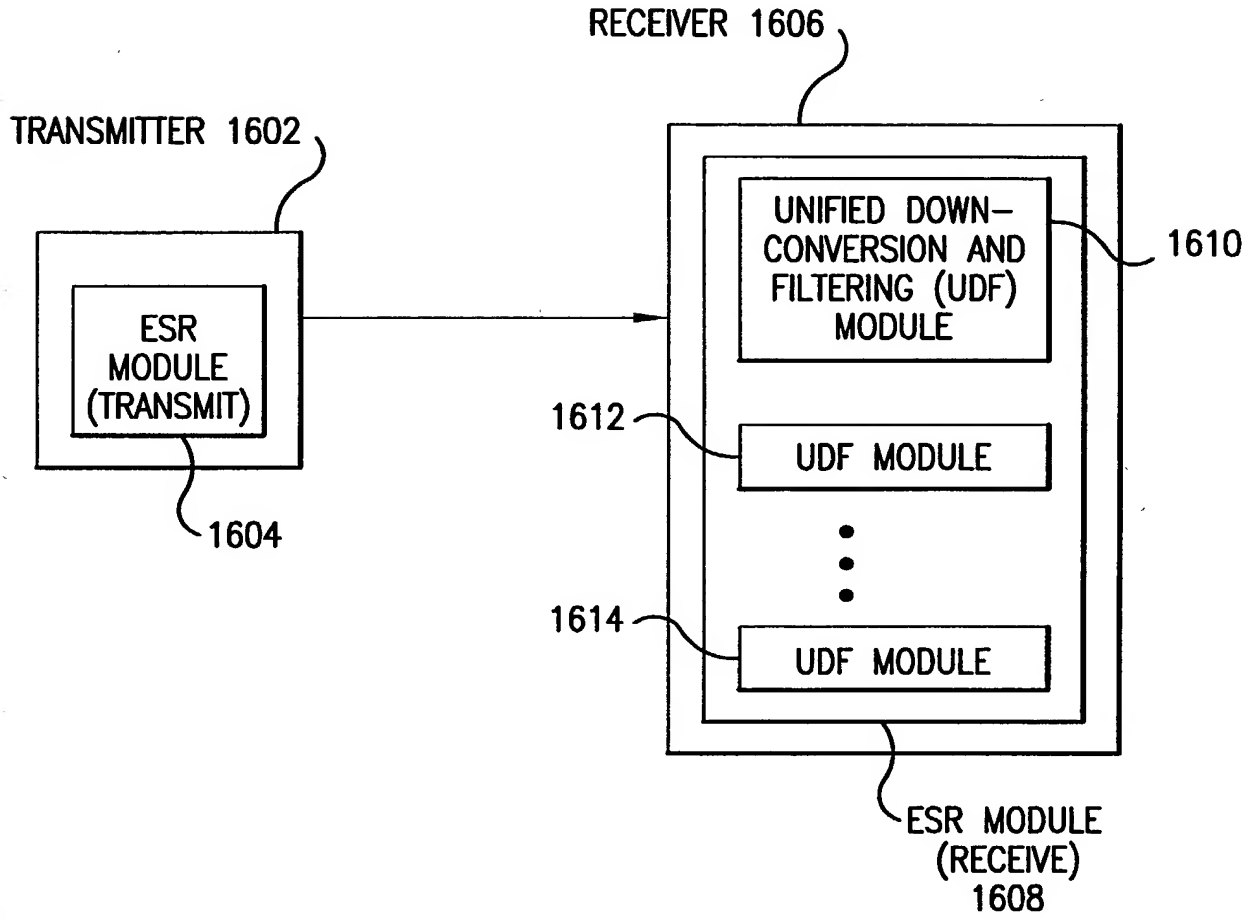
RECEIVER 1606
TRANSMITTER 1602
UNIFIED DOWN-CONVERSION AND FILTERING (UDF) MODULE
1610
ESR MODULE (TRANSMIT)
1612
UDF MODULE
1614
UDF MODULE
1604
ESR MODULE (RECEIVE) 1608

FIG. 16

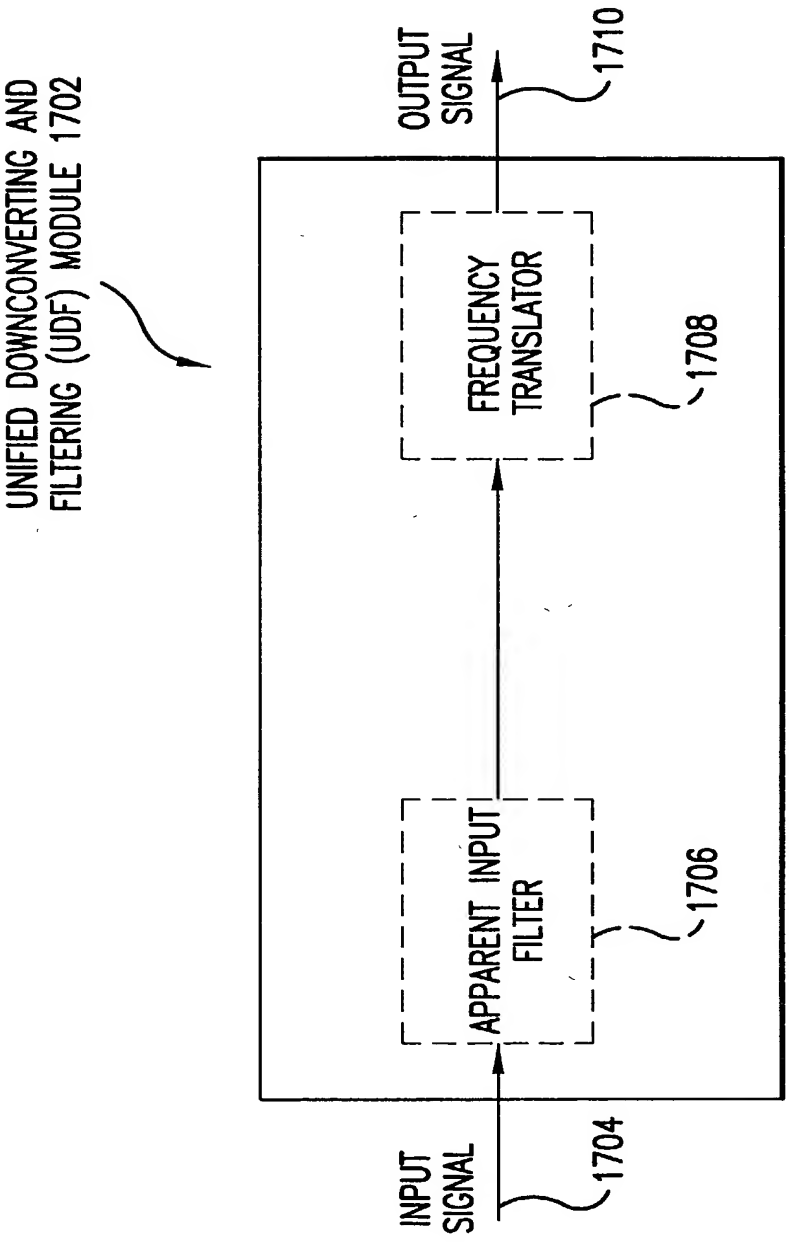
UNIFIED DOWNCONVERTING AND FILTERING (UDF) MODULE 1702
OUTPUT SIGNAL
1710
FREQUENCY TRANSLATOR
1708
APPARENT INPUT FILTER
1706
INPUT SIGNAL
1704

FIG. 17

1802

TIME / NODE	t−1 (RISING EDGE OF ϕ_1)	t−1 (RISING EDGE OF ϕ_2)	t (RISING EDGE OF ϕ_1)	t (RISING EDGE OF ϕ_2)	t+1 (RISING EDGE OF ϕ_1)
1902	VI_{t-1} 1804	VI_{t-1} 1808	VI_t 1816	VI_t 1826	VI_{t+1} 1838
1904	—	VI_{t-1} 1810	VI_{t-1} 1818	VI_t 1828	VI_t 1840
1906	VO_{t-1} 1806	VO_{t-1} 1812	VO_t 1820	VO_t 1830	VO_{t+1} 1842
1908	—	VO_{t-1} 1814	VO_{t-1} 1822	VO_t 1832	VO_t 1844
1910	— 1807	—	VO_{t-1} 1824	VO_{t-1} 1834	VO_t 1846
1912	—	— 1815	—	VO_{t-1} 1836	VO_{t-1} 1848
1918	—	—	—	—	VI_t − 0.1*VO_t − 0.8*VO_{t-1} 1850

FIG. 18

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Inventors Sorrells *et al*, Tel. 202/371-2600
Title Applications of Universal Frequency Translation

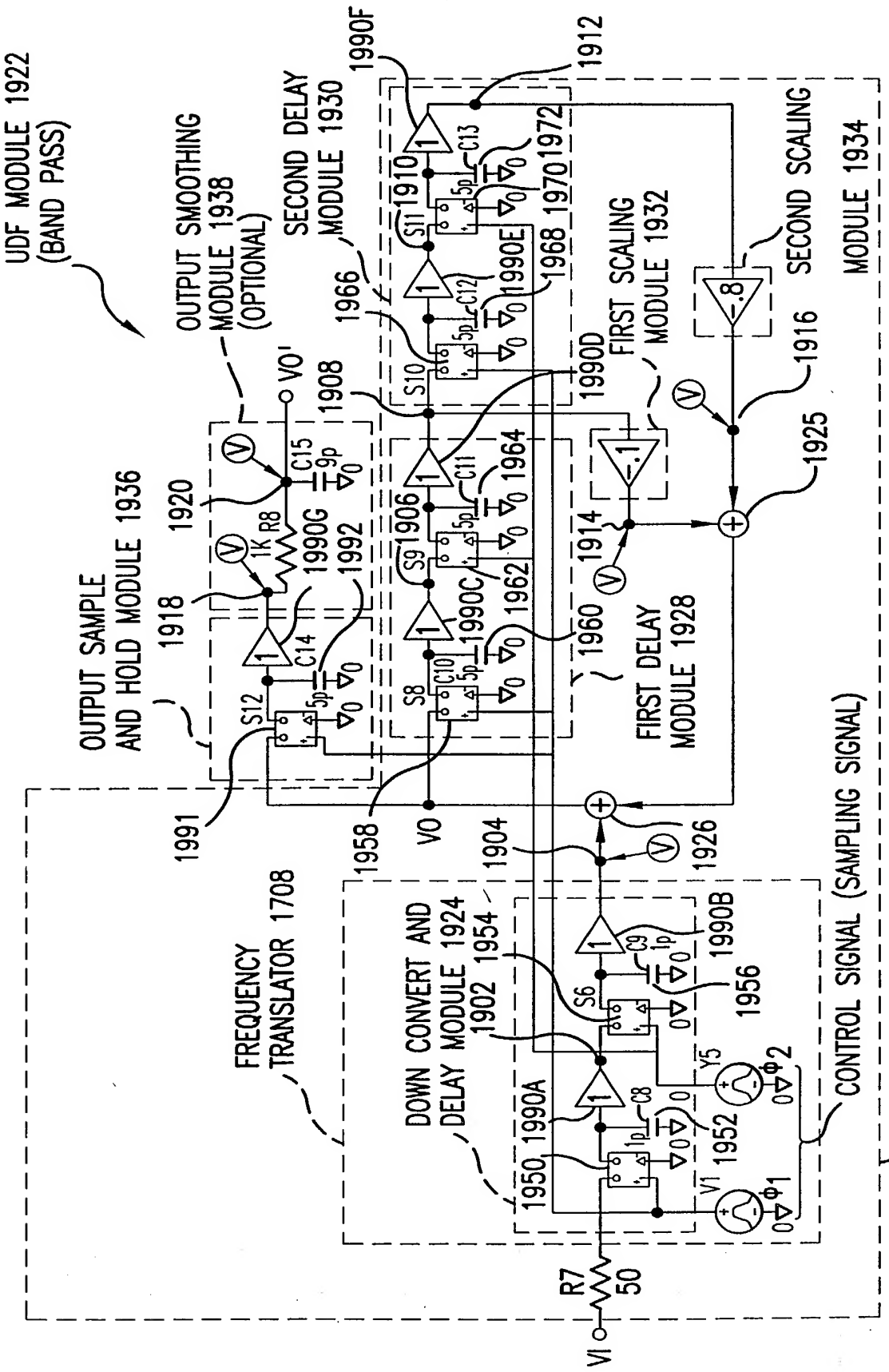
UDF MODULE 1922
(BAND PASS)
OUTPUT SAMPLE
AND HOLD MODULE 1936
OUTPUT SMOOTHING
MODULE 1938
(OPTIONAL)
SECOND DELAY
MODULE 1930
FIRST SCALING
MODULE 1932
SECOND SCALING
MODULE 1934
FIRST DELAY
MODULE 1928
DOWN CONVERT AND
DELAY MODULE 1924
FREQUENCY
TRANSLATOR 1708
CONTROL SIGNAL (SAMPLING SIGNAL)
INPUT FILTER 1706
VI
VO
VO'
R7
50
R8
1K
C15
9p
C14
5p
C10
5p
C11
5p
C12
5p
C13
5p
C9
1p
C8
1p
S12
S8
S9
S10
S11
S6
1990A
1990B
1990C
1990D
1990E
1990F
1990G
1902
1904
1906
1908
1910
1912
1914
1916
1918
1920
1925
1926
1928
1930
1932
1934
1936
1938
1950
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1991
1992
.1
.8
Y5
V1
Φ1
Φ2

FIG. 19

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Dkt No 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al.*, Tel 202/371-2600
Title Applications of Universal Frequency Translation

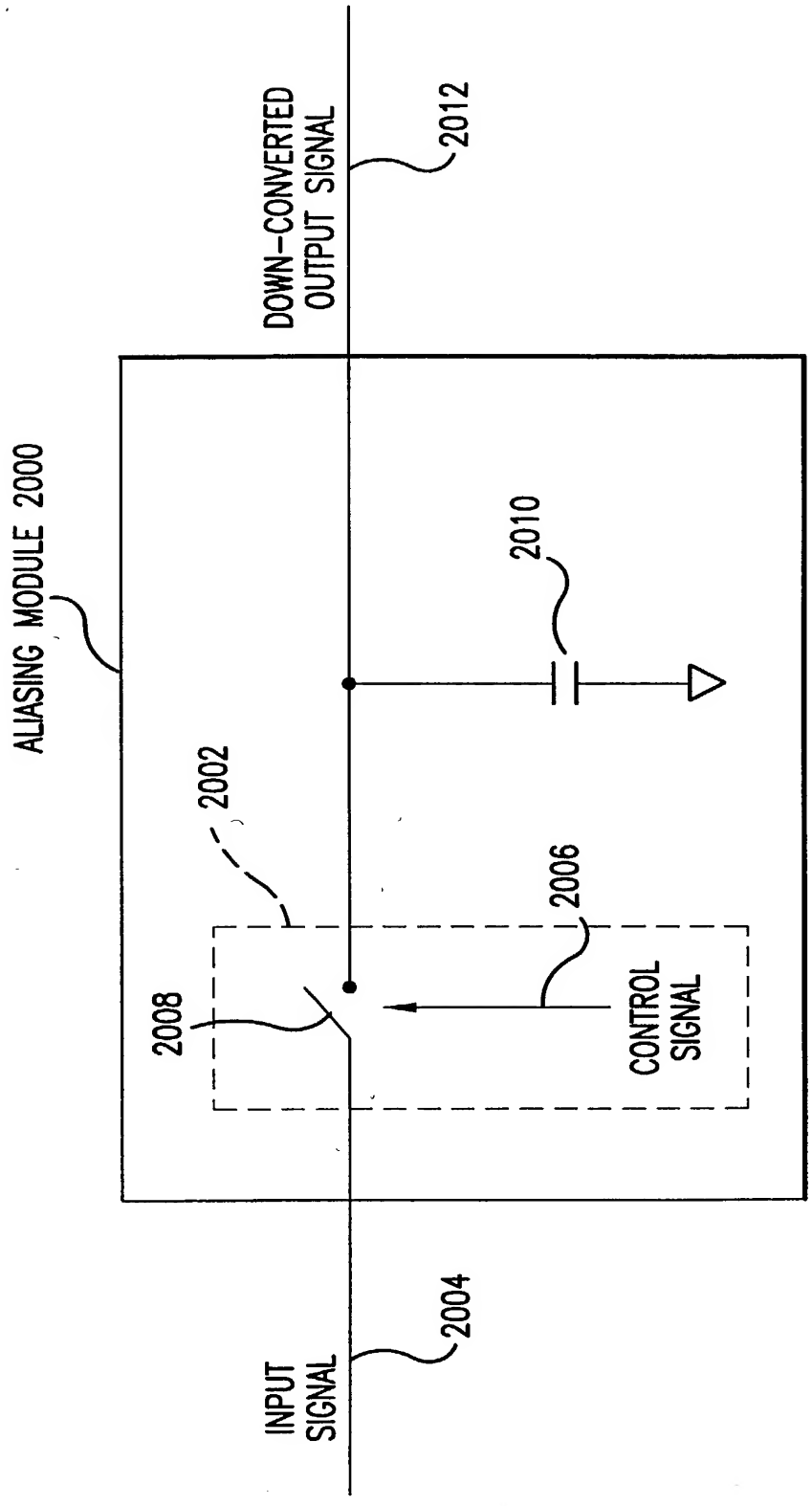

FIG. 20A

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Dkt No 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al*, Tel 202/371-2600
Title Applications of Universal Frequency Translation

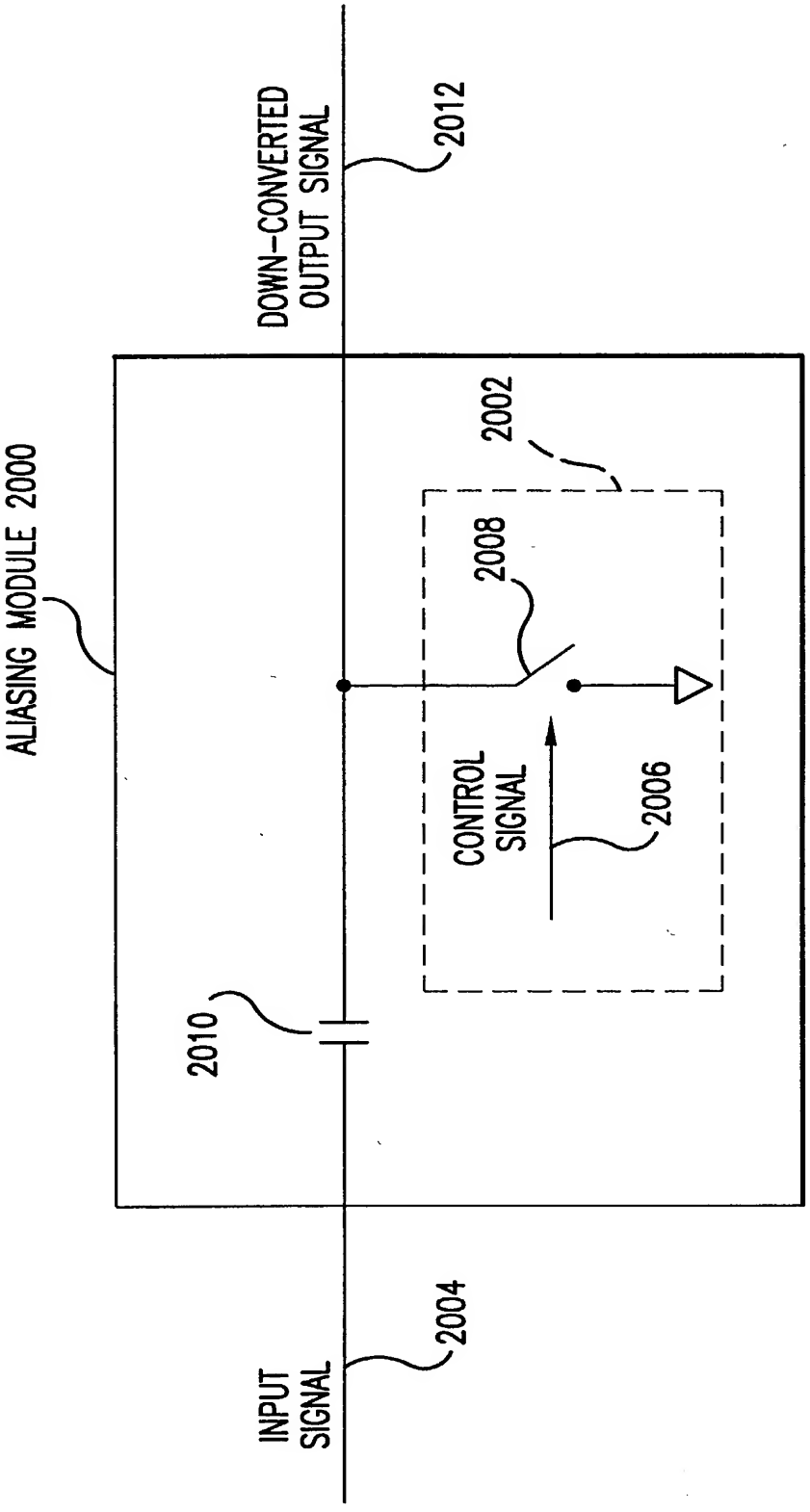

FIG. 20A-1

Appl No 10/086,250, Filed March 4, 2002
Dkt No. 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al* , Tel 202/371-2600
Title Applications of Universal Frequency Translation

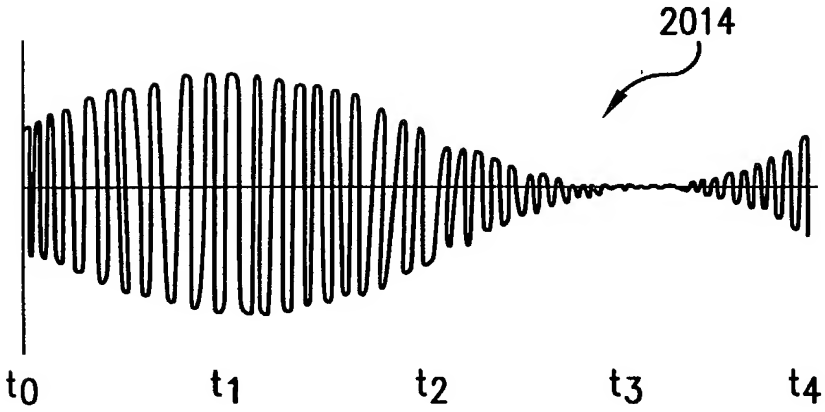

FIG. 20B

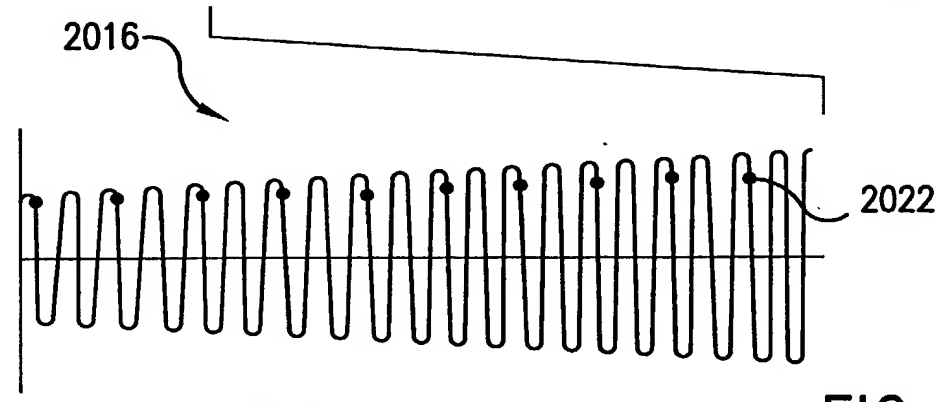

FIG. 20C

FIG. 20D

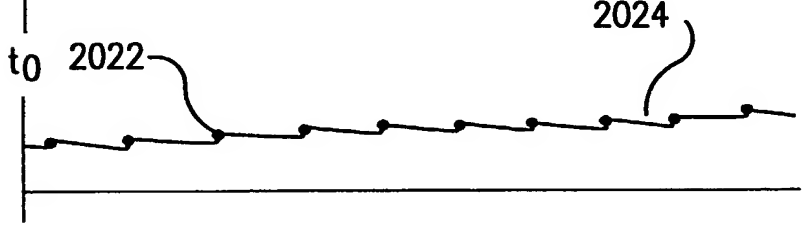

FIG. 20E

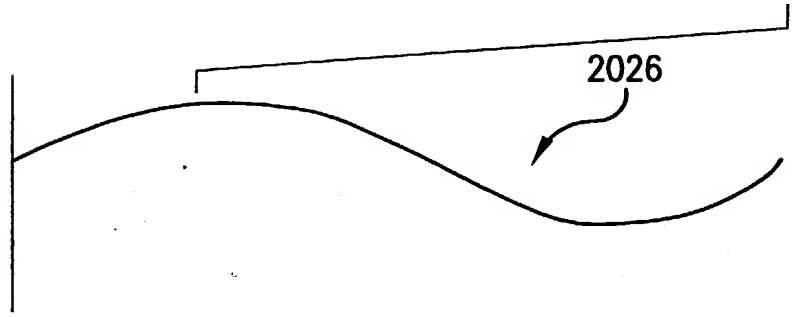

FIG. 20F

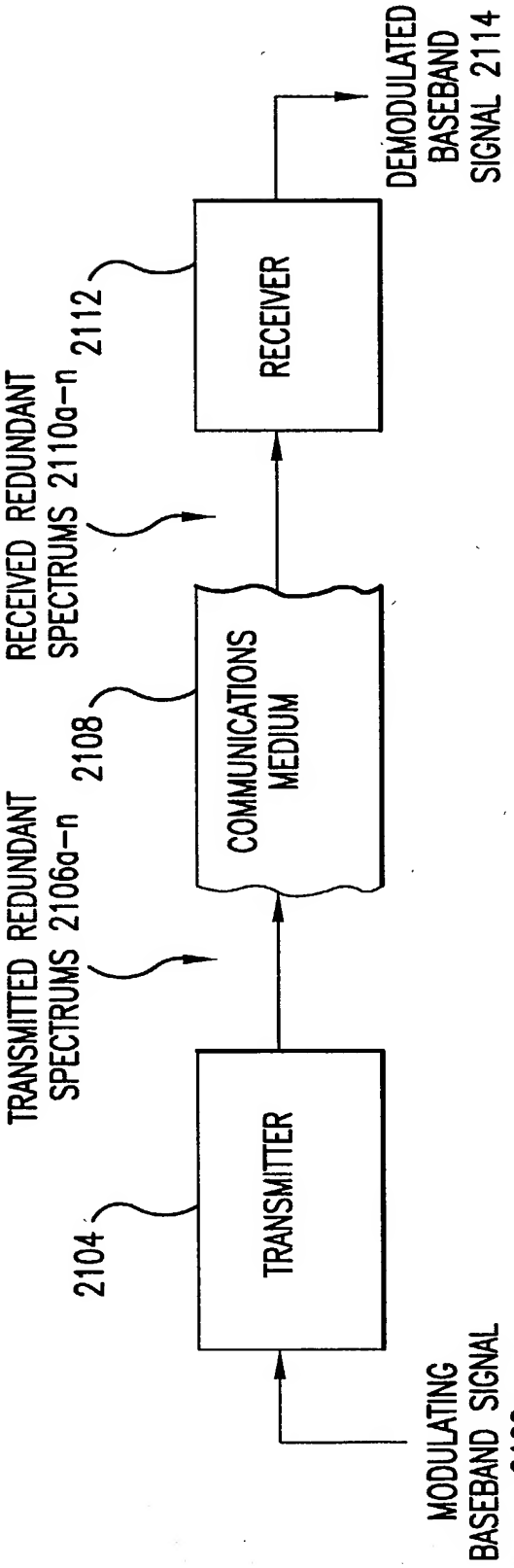
MODULATING BASEBAND SIGNAL 2102
2104
TRANSMITTER
TRANSMITTED REDUNDANT SPECTRUMS 2106a–n
2108
COMMUNICATIONS MEDIUM
RECEIVED REDUNDANT SPECTRUMS 2110a–n
2112
RECEIVER
DEMODULATED BASEBAND SIGNAL 2114

FIG. 21

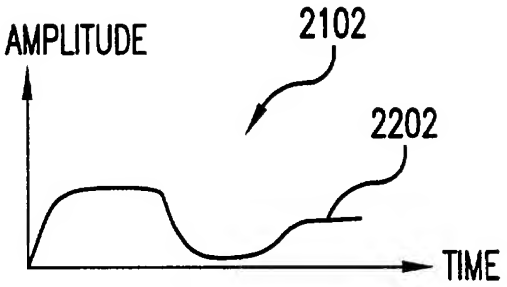

FIG. 22A

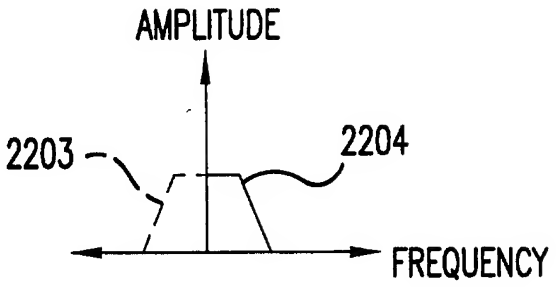

FIG. 22B

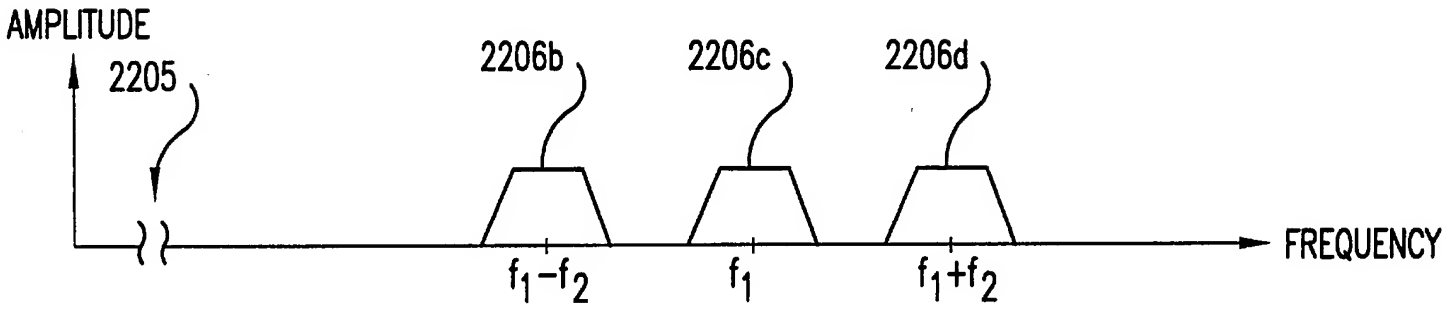

FIG. 22C

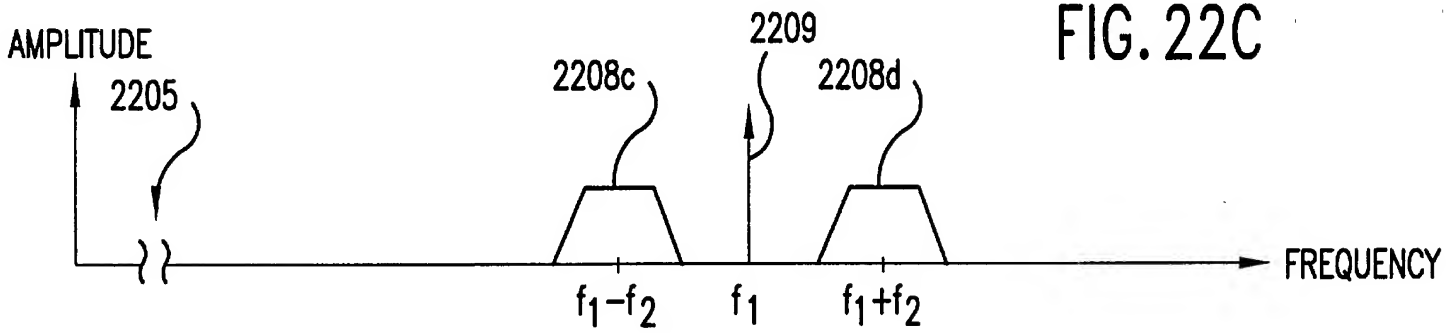

FIG. 22D

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Dkt No 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al.*, Tel 202/371-2600
Title Applications of Universal Frequency Translation

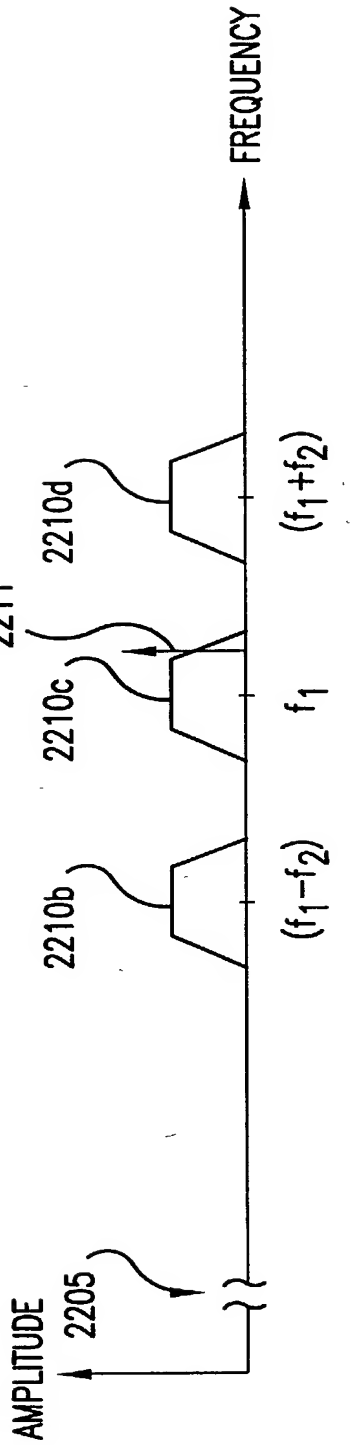

FIG. 22E

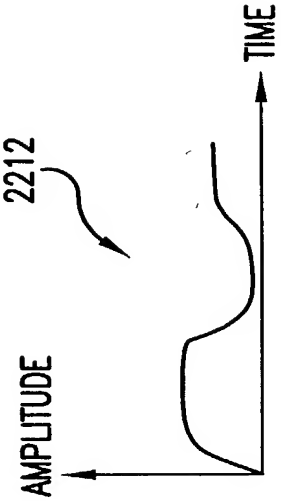

FIG. 22F

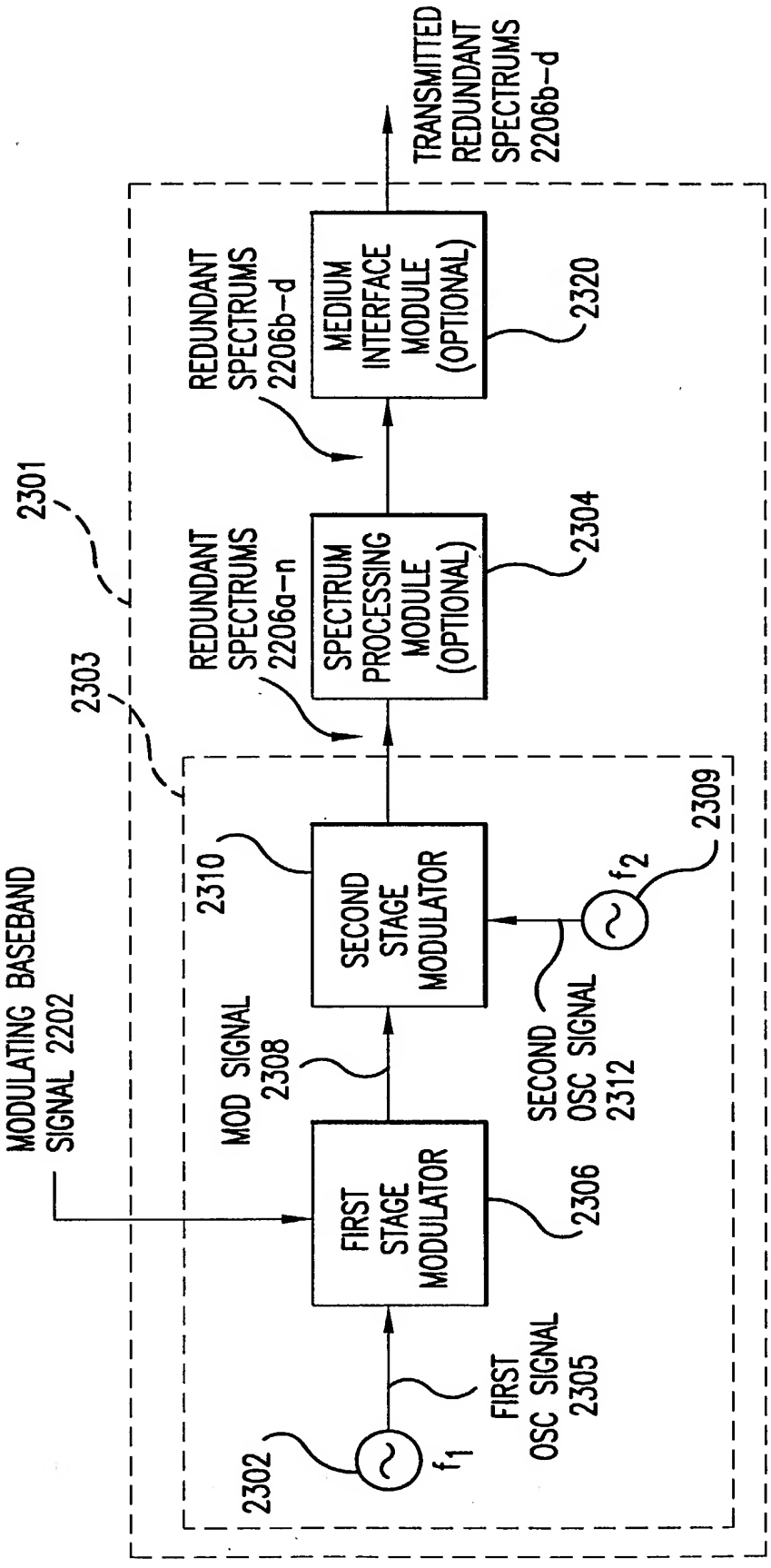
TRANSMITTED REDUNDANT SPECTRUMS 2206b-d
REDUNDANT SPECTRUMS 2206b-d
MEDIUM INTERFACE MODULE (OPTIONAL)
2320
2301
REDUNDANT SPECTRUMS 2206a-n
SPECTRUM PROCESSING MODULE (OPTIONAL)
2304
2303
2310
SECOND STAGE MODULATOR
2309
f_2
MODULATING BASEBAND SIGNAL 2202
MOD SIGNAL 2308
SECOND OSC SIGNAL 2312
FIRST STAGE MODULATOR
2306
FIRST OSC SIGNAL 2305
2302
f_1

FIG. 23A

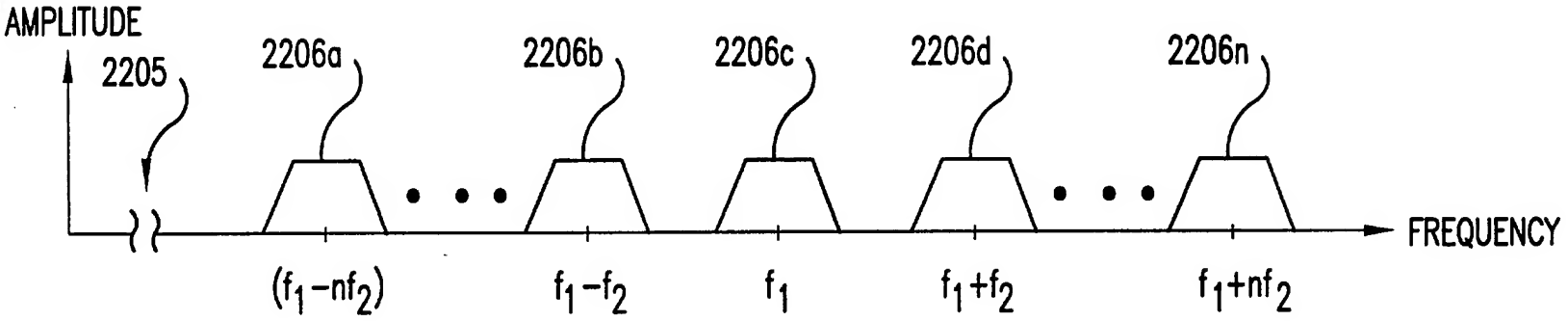

FIG. 23B

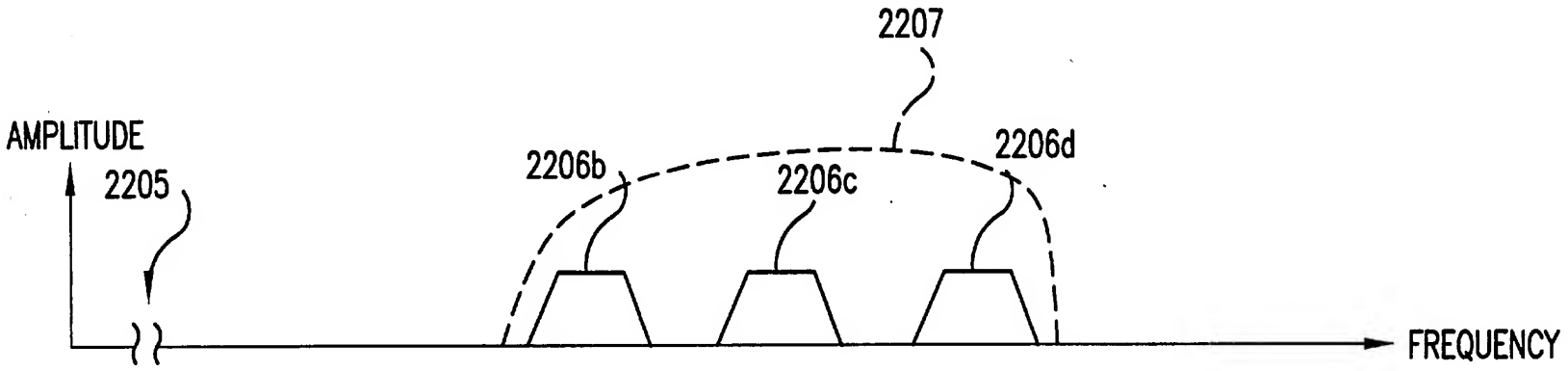

FIG. 23C

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Dkt No 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al*, Tel 202/371-2600
Title: Applications of Unversal Frequency Translation

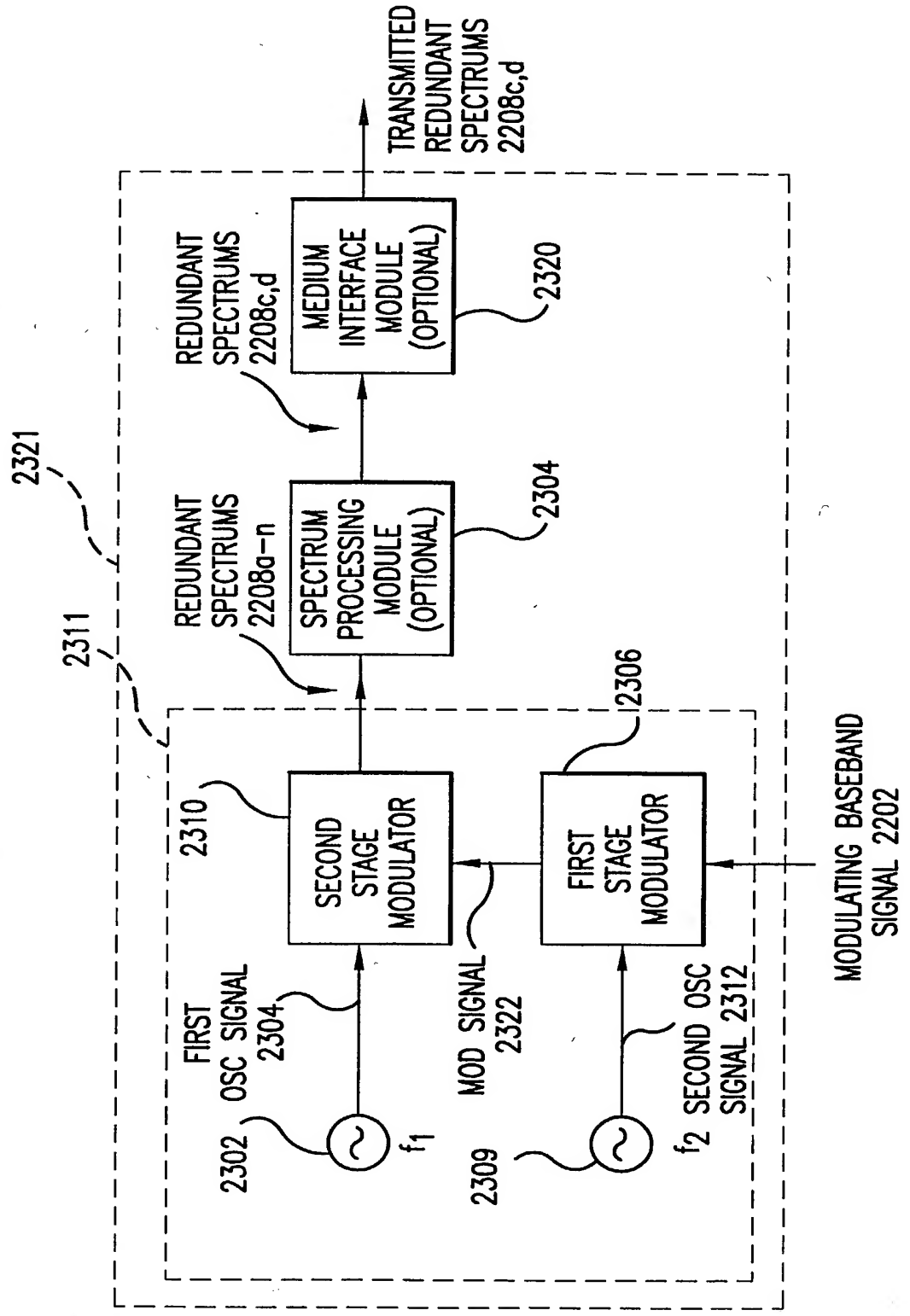
TRANSMITTED REDUNDANT SPECTRUMS 2208c,d
REDUNDANT SPECTRUMS 2208c,d
MEDIUM INTERFACE MODULE (OPTIONAL)
2320
2321
REDUNDANT SPECTRUMS 2208a–n
SPECTRUM PROCESSING MODULE (OPTIONAL)
2304
2311
2306
2310
SECOND STAGE MODULATOR
FIRST STAGE MODULATOR
MODULATING BASEBAND SIGNAL 2202
FIRST OSC SIGNAL 2304
MOD SIGNAL 2322
2302
f_1
2309
f_2
SECOND OSC SIGNAL 2312

FIG. 23D

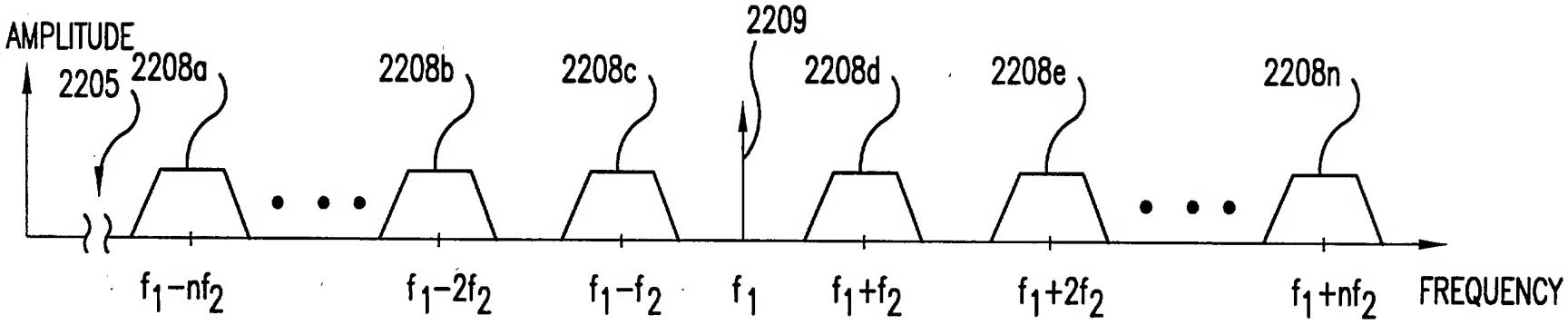

FIG. 23E

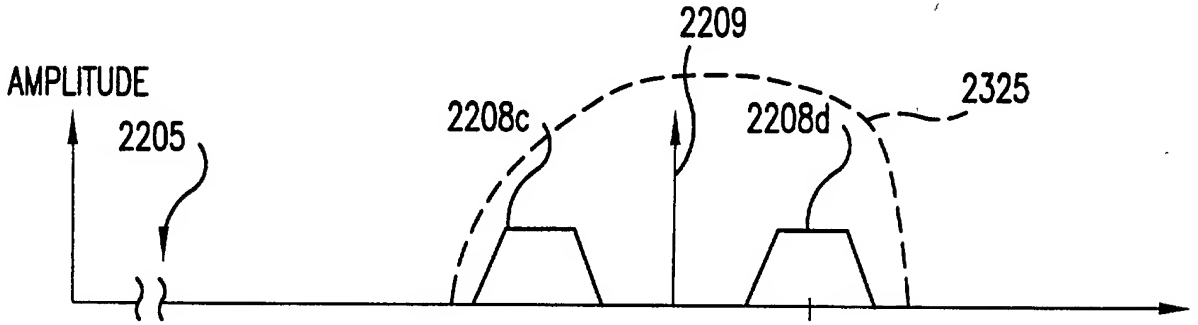

FIG. 23F

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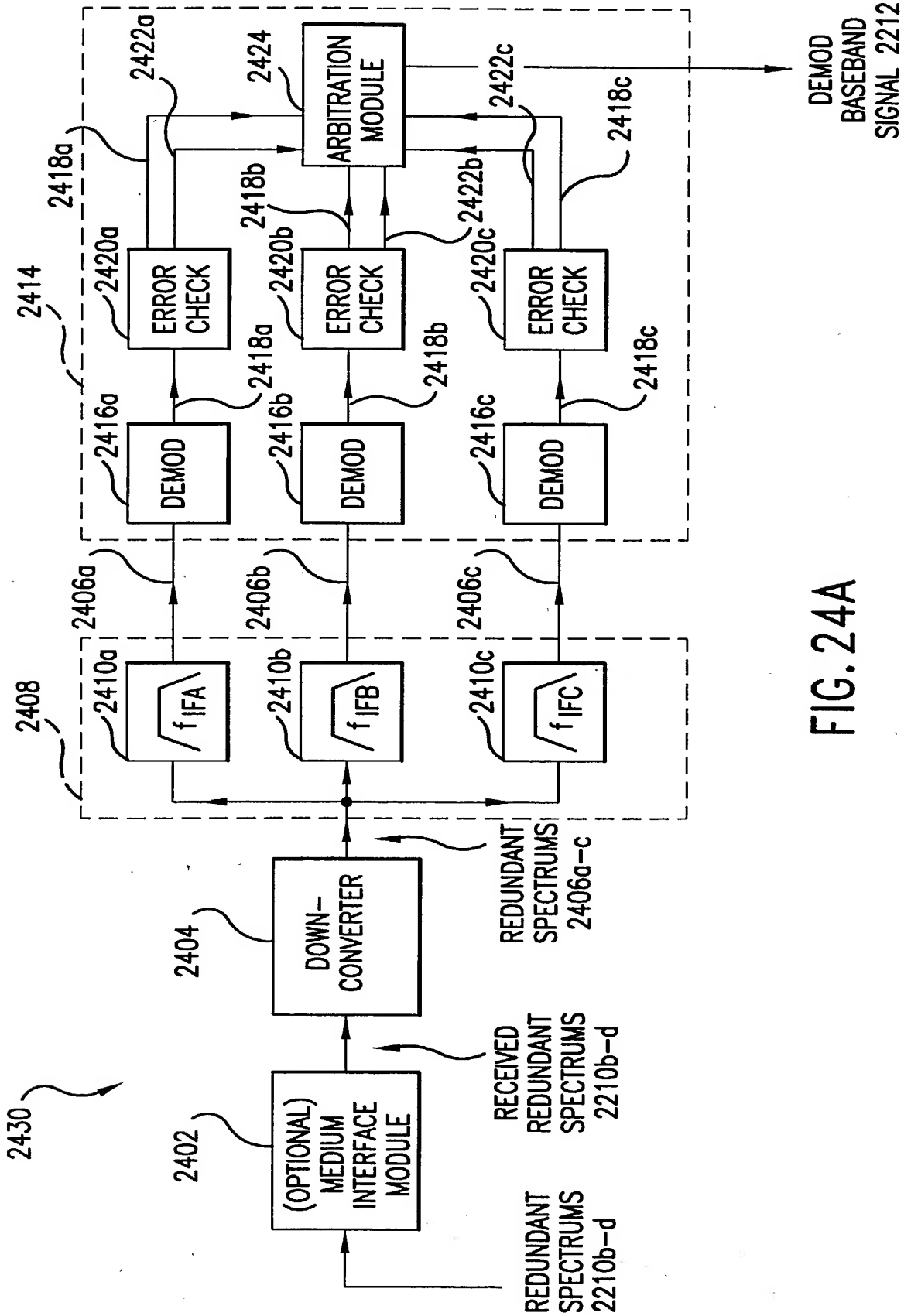
2430
2402
(OPTIONAL) MEDIUM INTERFACE MODULE
REDUNDANT SPECTRUMS 2210b–d
RECEIVED REDUNDANT SPECTRUMS 2210b–d
2404
DOWN-CONVERTER
REDUNDANT SPECTRUMS 2406a–c
2408
2410a
f_{IFA}
2410b
f_{IFB}
2410c
f_{IFC}
2406a
2406b
2406c
2414
2416a
DEMOD
2416b
DEMOD
2416c
DEMOD
2418a
2418b
2418c
2420a
ERROR CHECK
2420b
ERROR CHECK
2420c
ERROR CHECK
2422a
2422b
2422c
2424
ARBITRATION MODULE
DEMOD BASEBAND SIGNAL 2212

FIG. 24A

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Dkt No 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al*, Tel 202/371-2600
Title Applications of Universal Frequency Translation

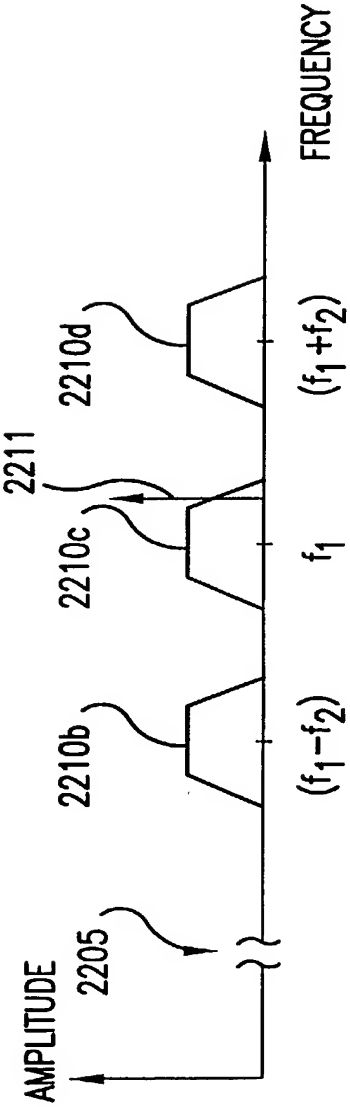

FIG. 24B

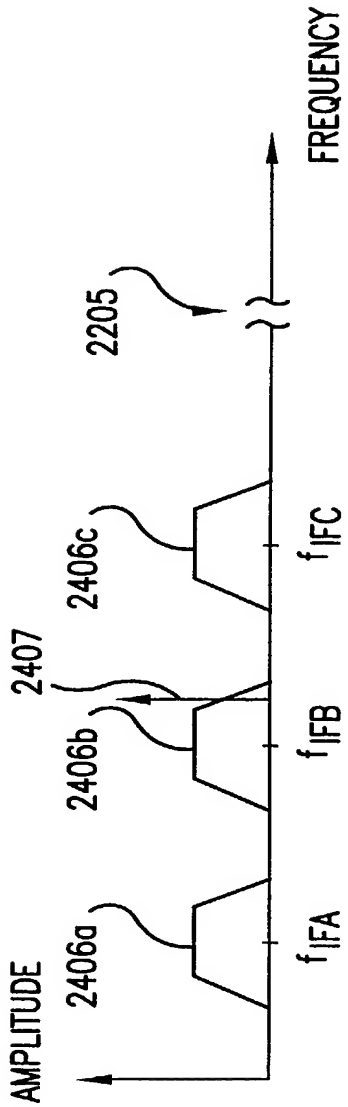

FIG. 24C

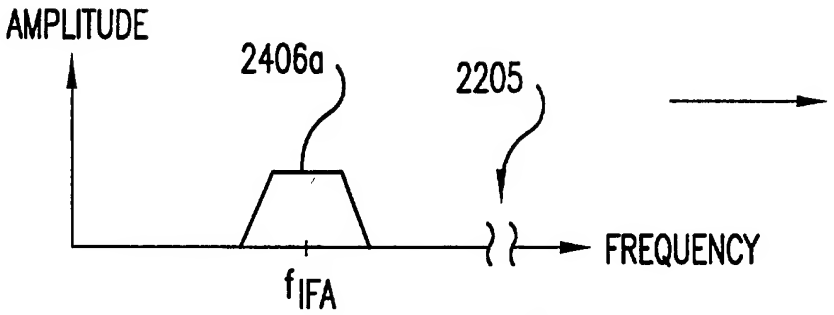

FIG. 24D

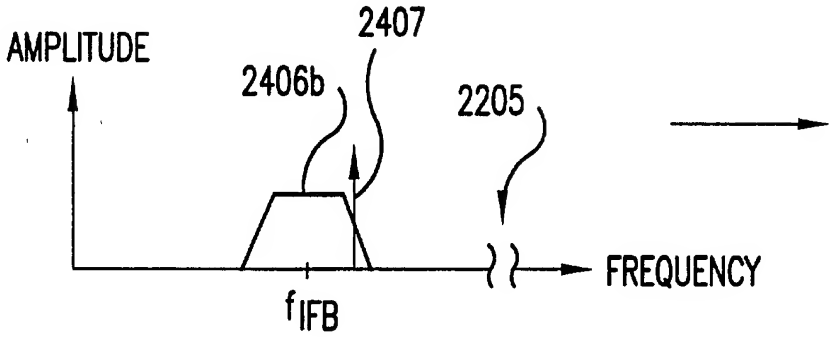

FIG. 24E

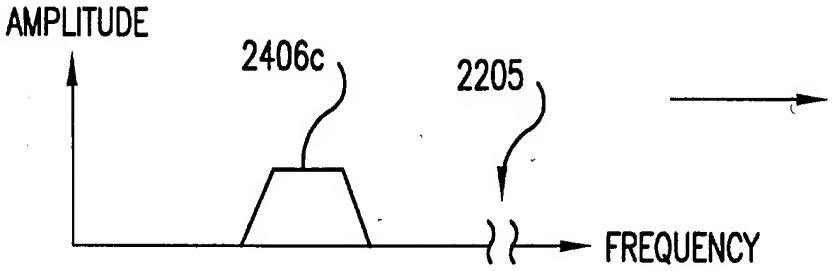

FIG. 24F

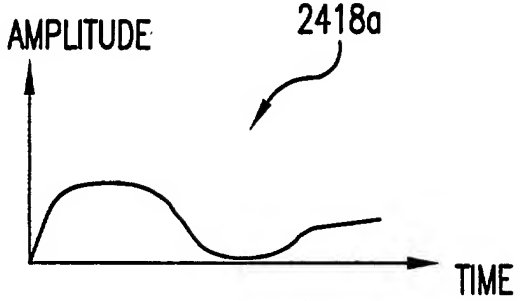

FIG. 24G

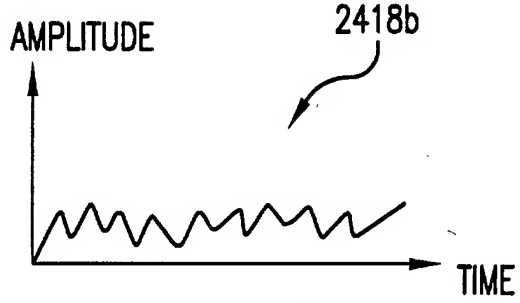

FIG. 24H

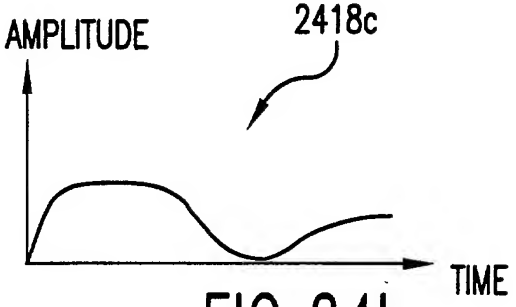

FIG. 24I

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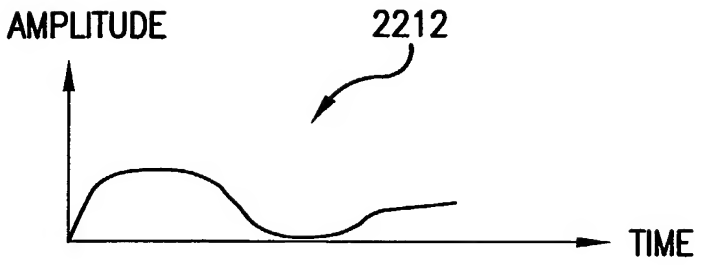

FIG. 24J

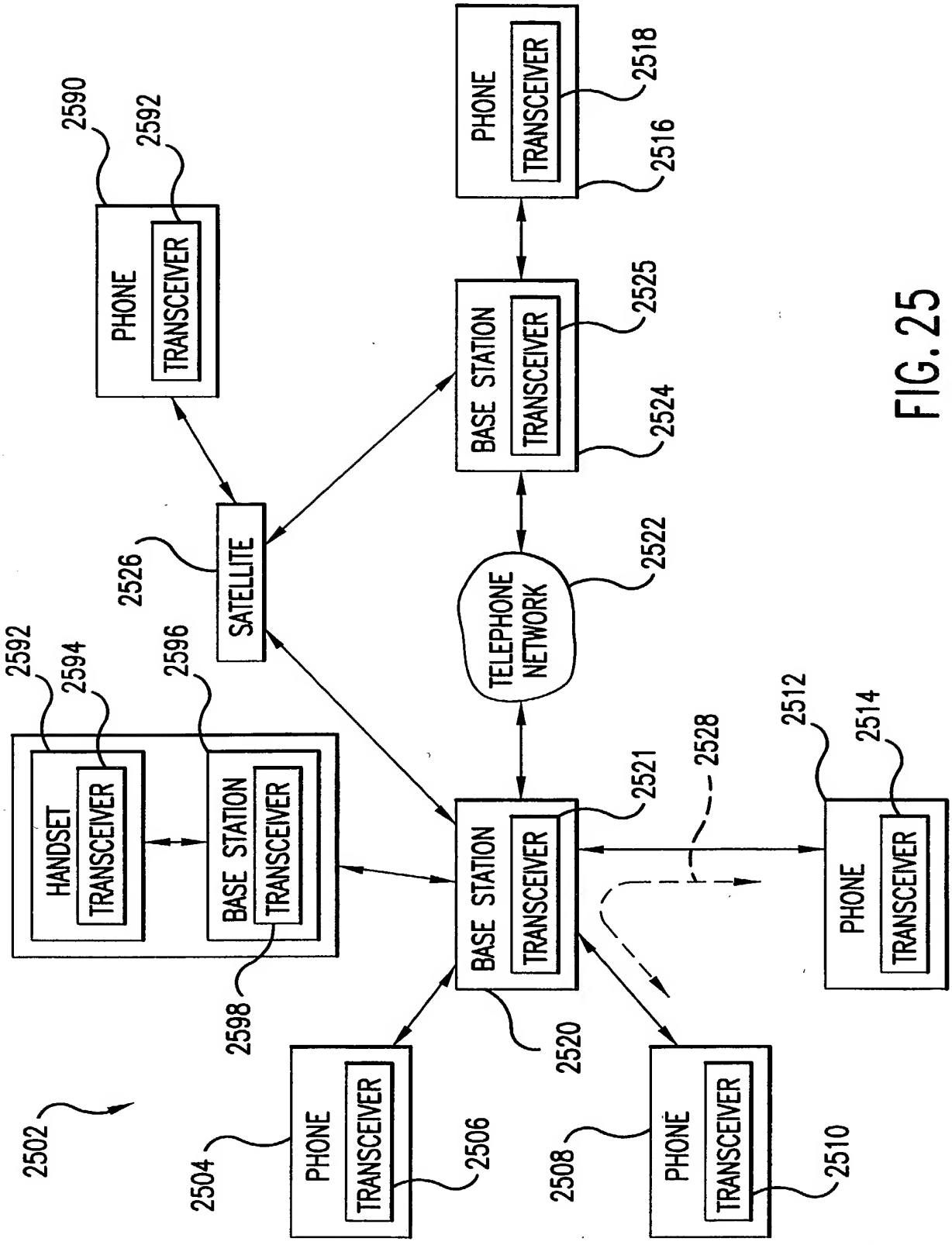
2502
2504
PHONE
TRANSCEIVER
2506
2508
PHONE
TRANSCEIVER
2510
2512
PHONE
TRANSCEIVER
2514
2516
PHONE
TRANSCEIVER
2518
2520
BASE STATION
TRANSCEIVER
2521
2522
TELEPHONE NETWORK
2524
BASE STATION
TRANSCEIVER
2525
2526
SATELLITE
2528
2590
PHONE
TRANSCEIVER
2592
2592
HANDSET
TRANSCEIVER
2594
2596
BASE STATION
TRANSCEIVER
2598

FIG. 25

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Dkt No 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al*, Tel 202/371-2600
Title Applications of Universal Frequency Translation

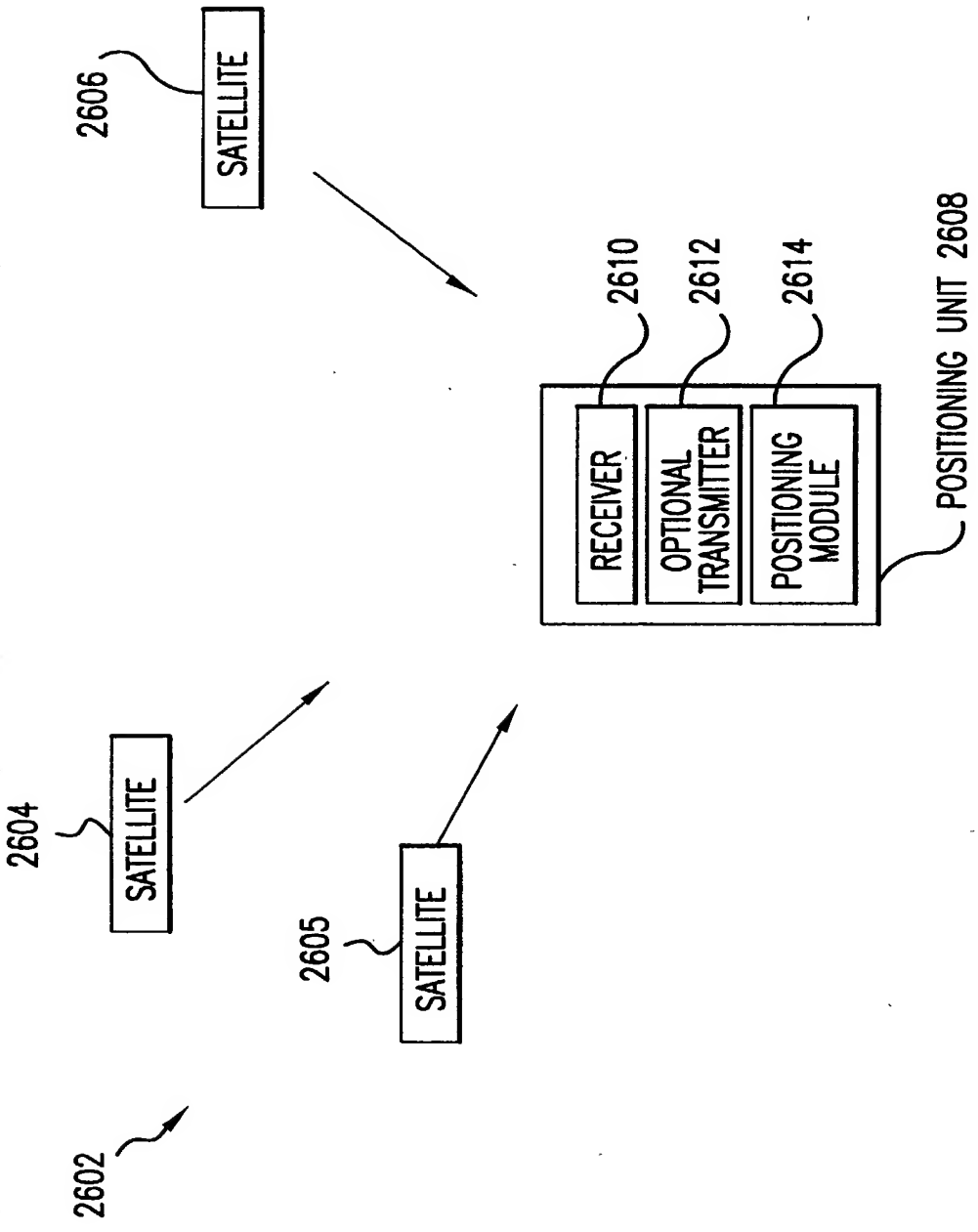

FIG. 26

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Dkt No 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al*, Tel 202/371-2600
Title Applications of Universal Frequency Translation

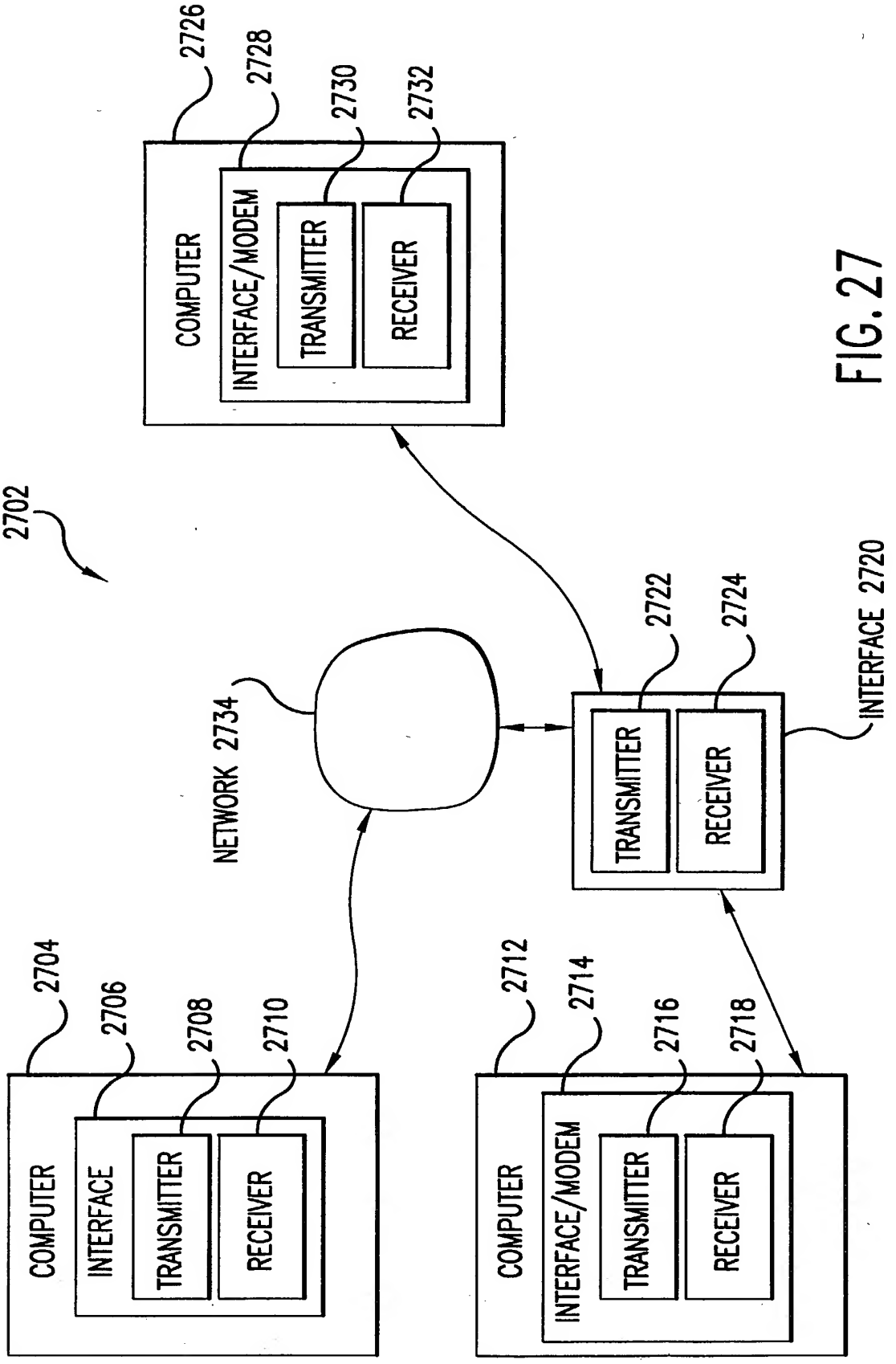

FIG. 27

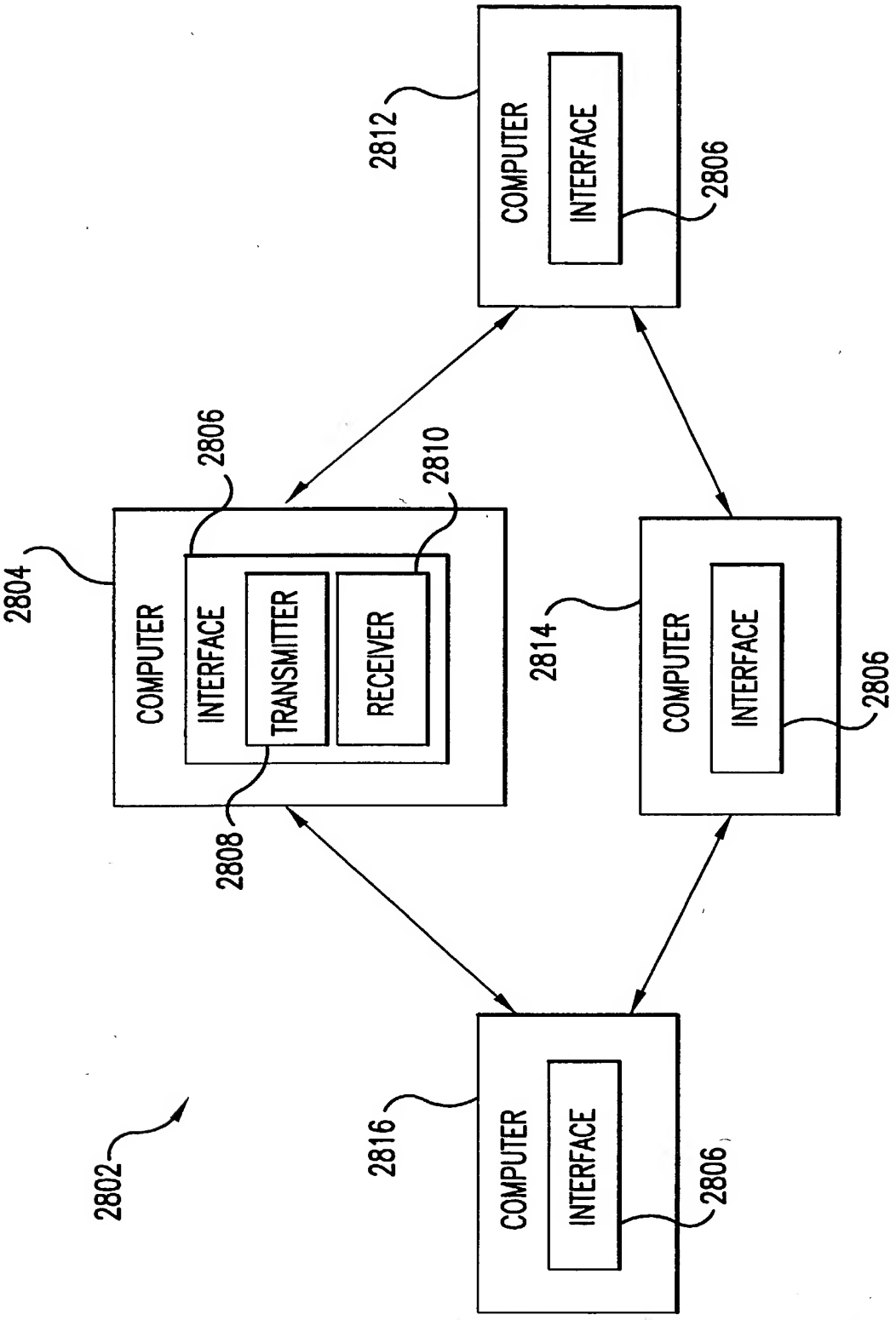
2802
2804
COMPUTER
INTERFACE
TRANSMITTER
RECEIVER
2806
2808
2810
2812
COMPUTER
INTERFACE
2806
2814
COMPUTER
INTERFACE
2806
2816
COMPUTER
INTERFACE
2806

FIG. 28

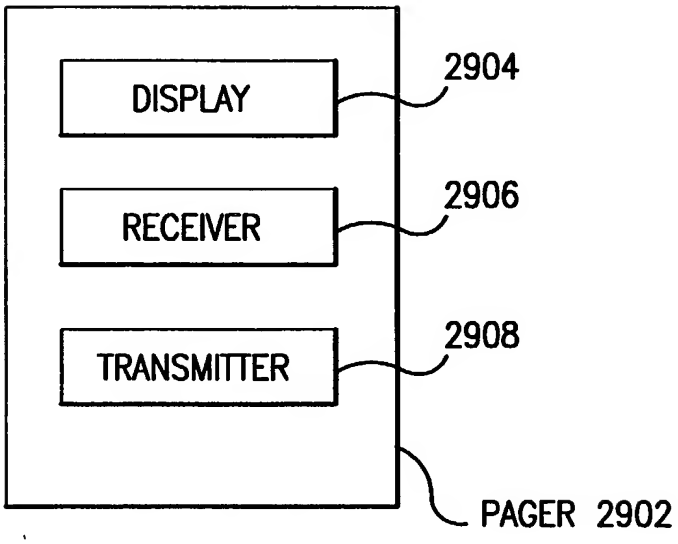

FIG. 29

Appl No 10/086,250, Filed March 4, 2002
Dkt No 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al*, Tel 202/371-2600
Title Applications of Universal Frequency Translation

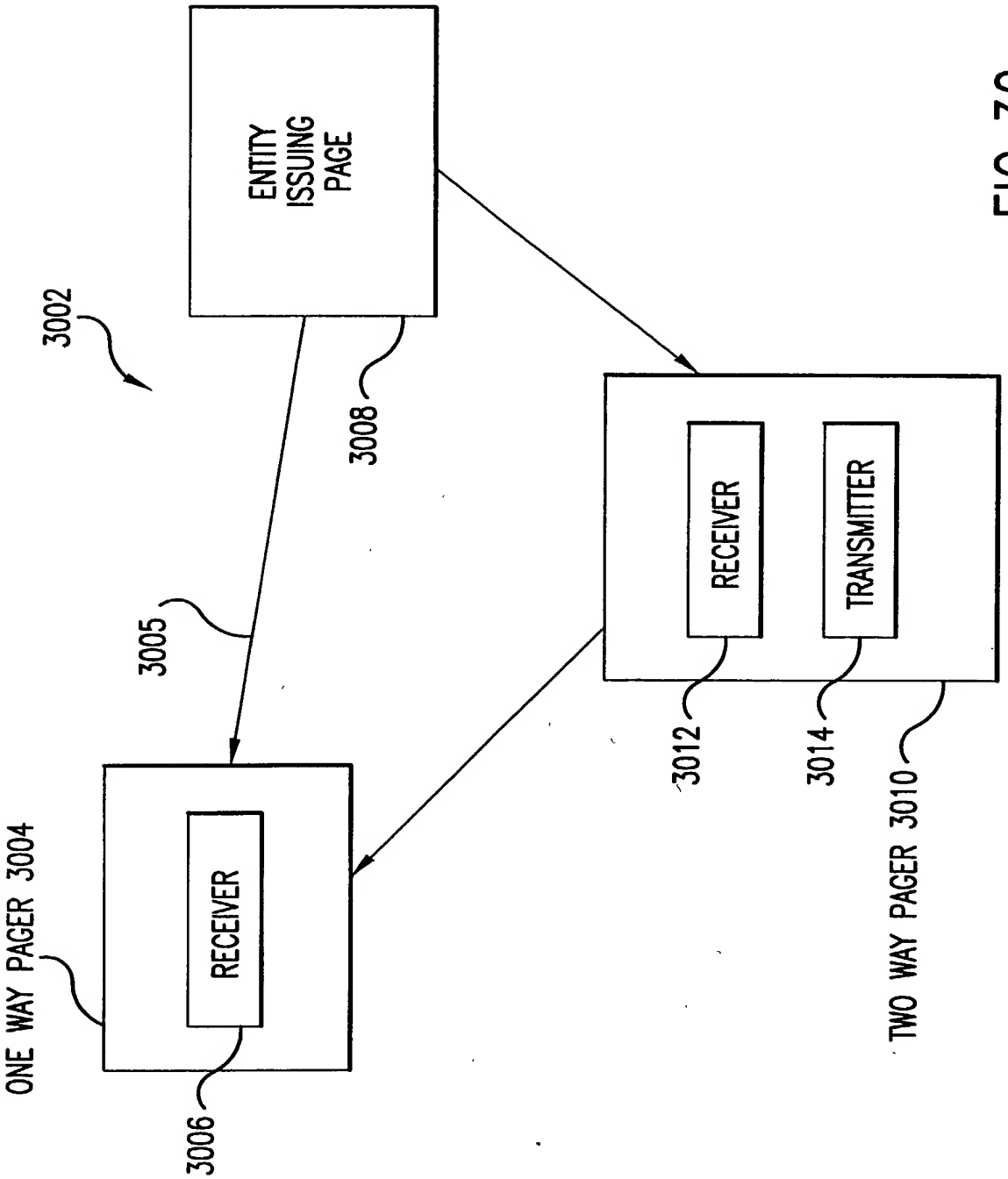

FIG. 30

Appl No 10/086,250, Filed March 4, 2002
Dkt No 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al*, Tel 202/371-2600
Title Applications of Universal Frequency Translation

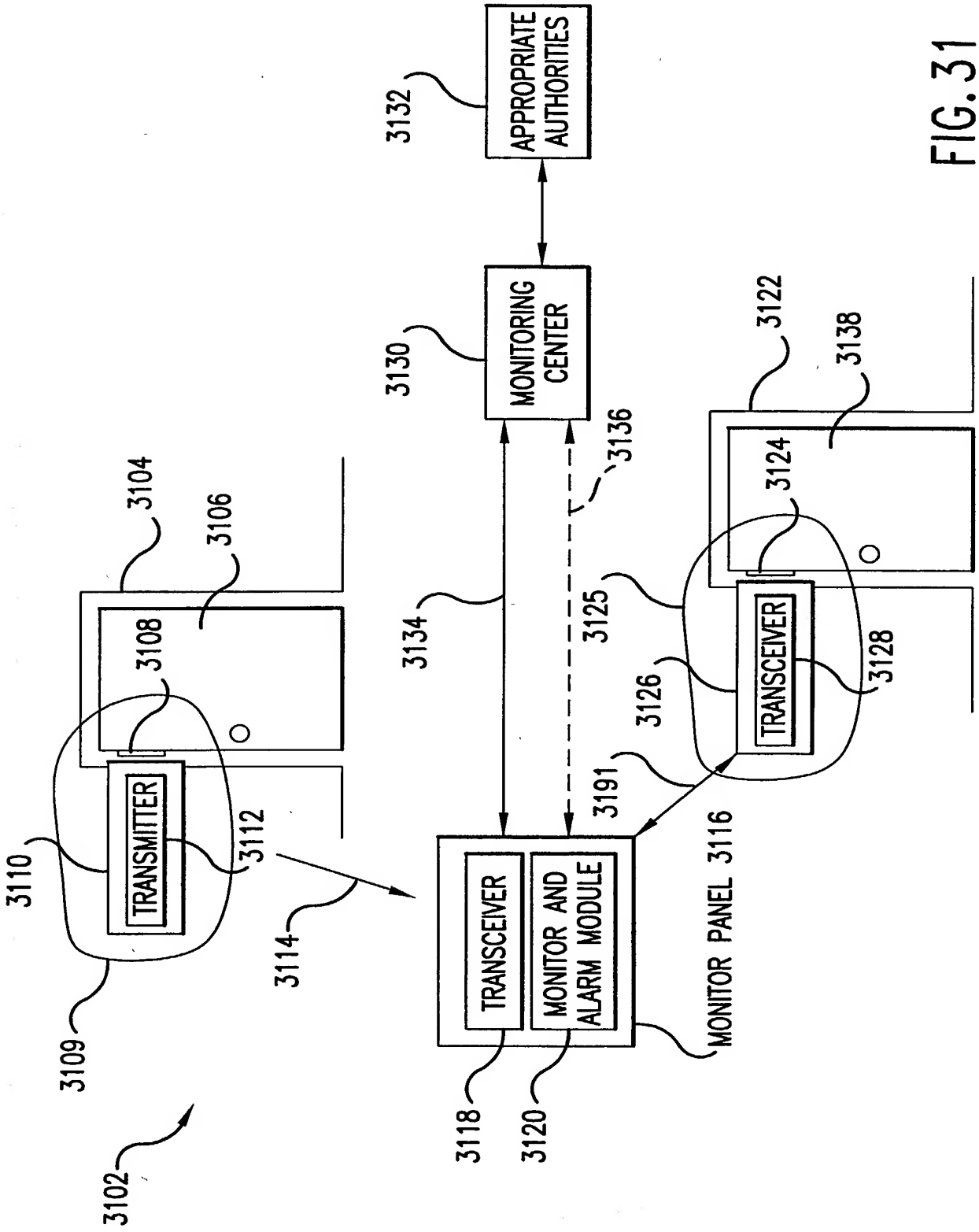

FIG. 31

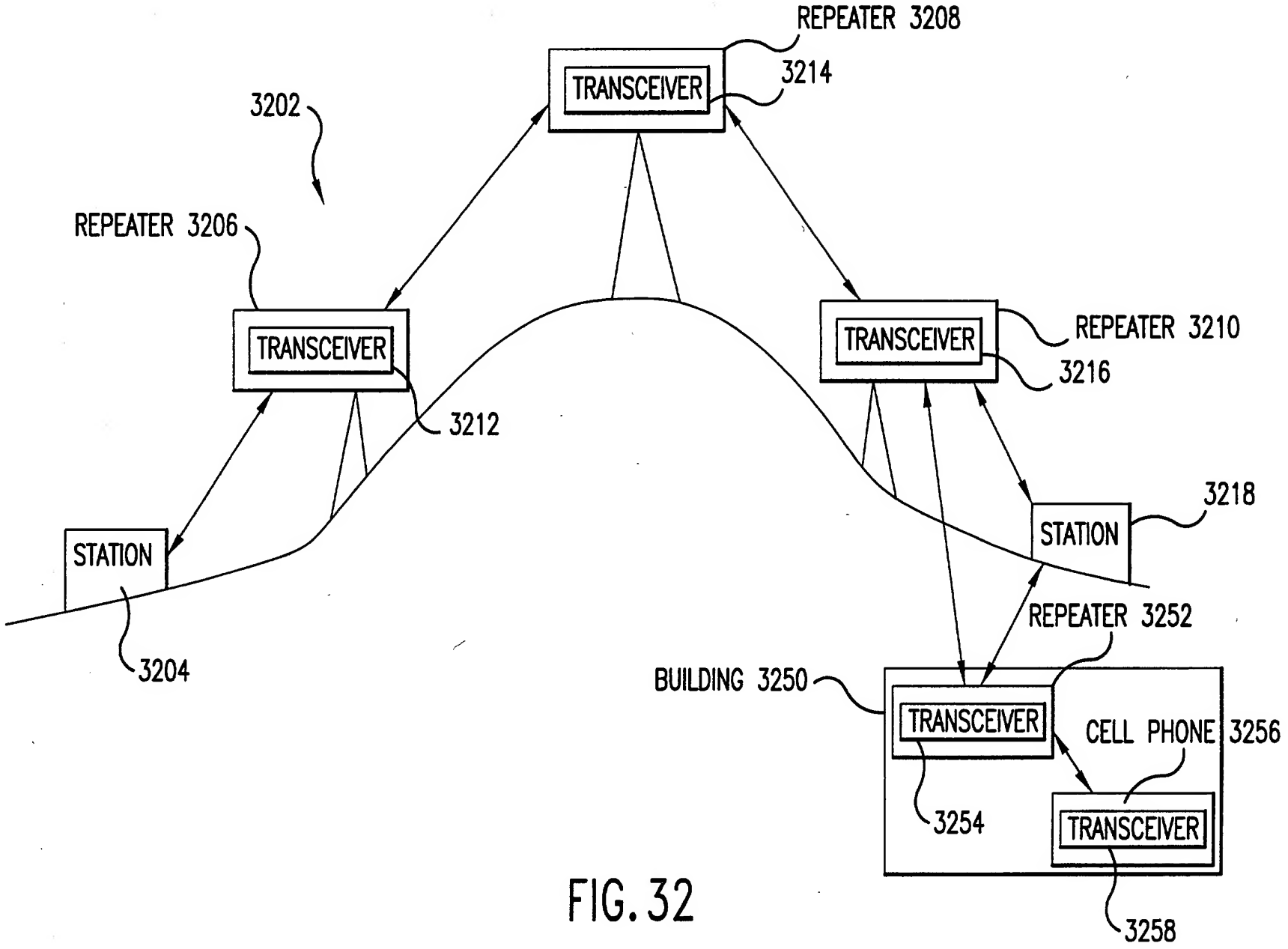

FIG. 32

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Inventors Sorrells *et al*., Tel. 202/371-2600
Title Applications of Universal Frequency Translation

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Dkt No 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al* ; Tel 202/371-2600
Title Applications of Universal Frequency Translation

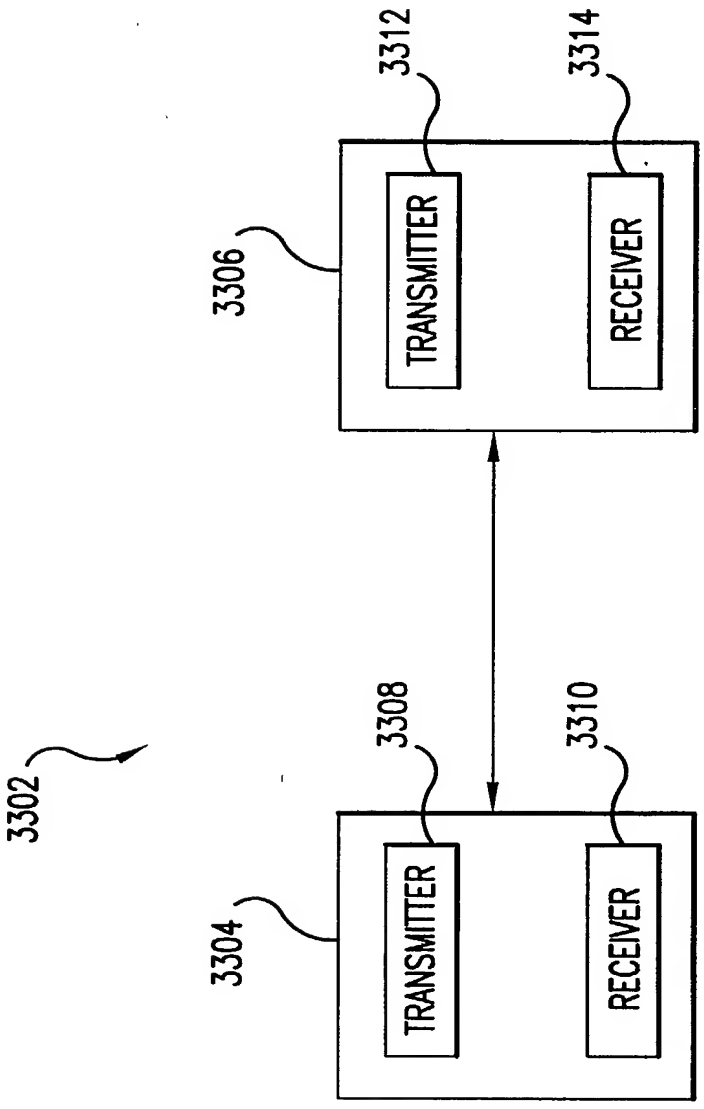

FIG. 33

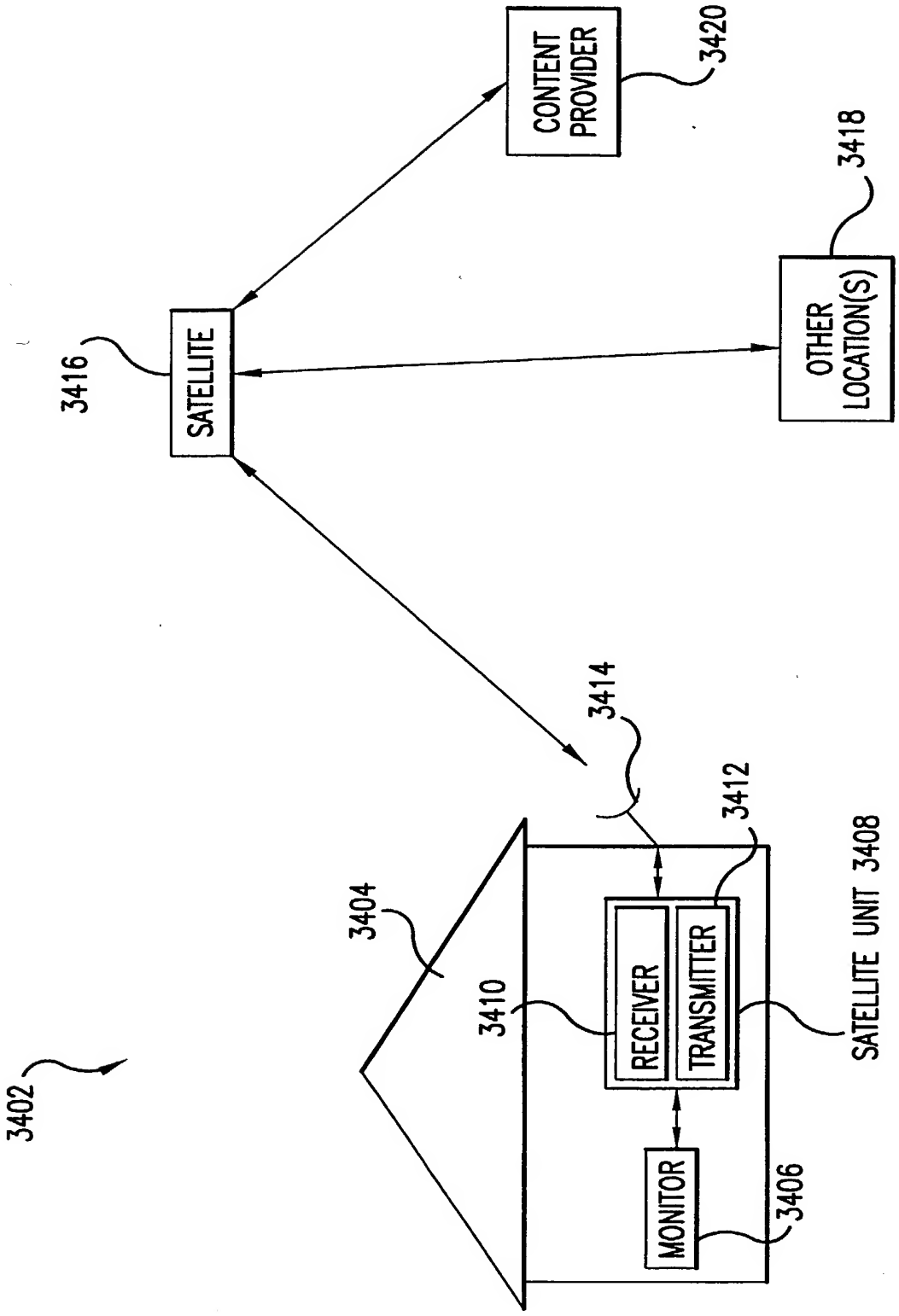
3402
3404
3406
MONITOR
3408
SATELLITE UNIT
3410
RECEIVER
3412
TRANSMITTER
3414
3416
SATELLITE
3418
OTHER LOCATION(S)
3420
CONTENT PROVIDER

FIG. 34

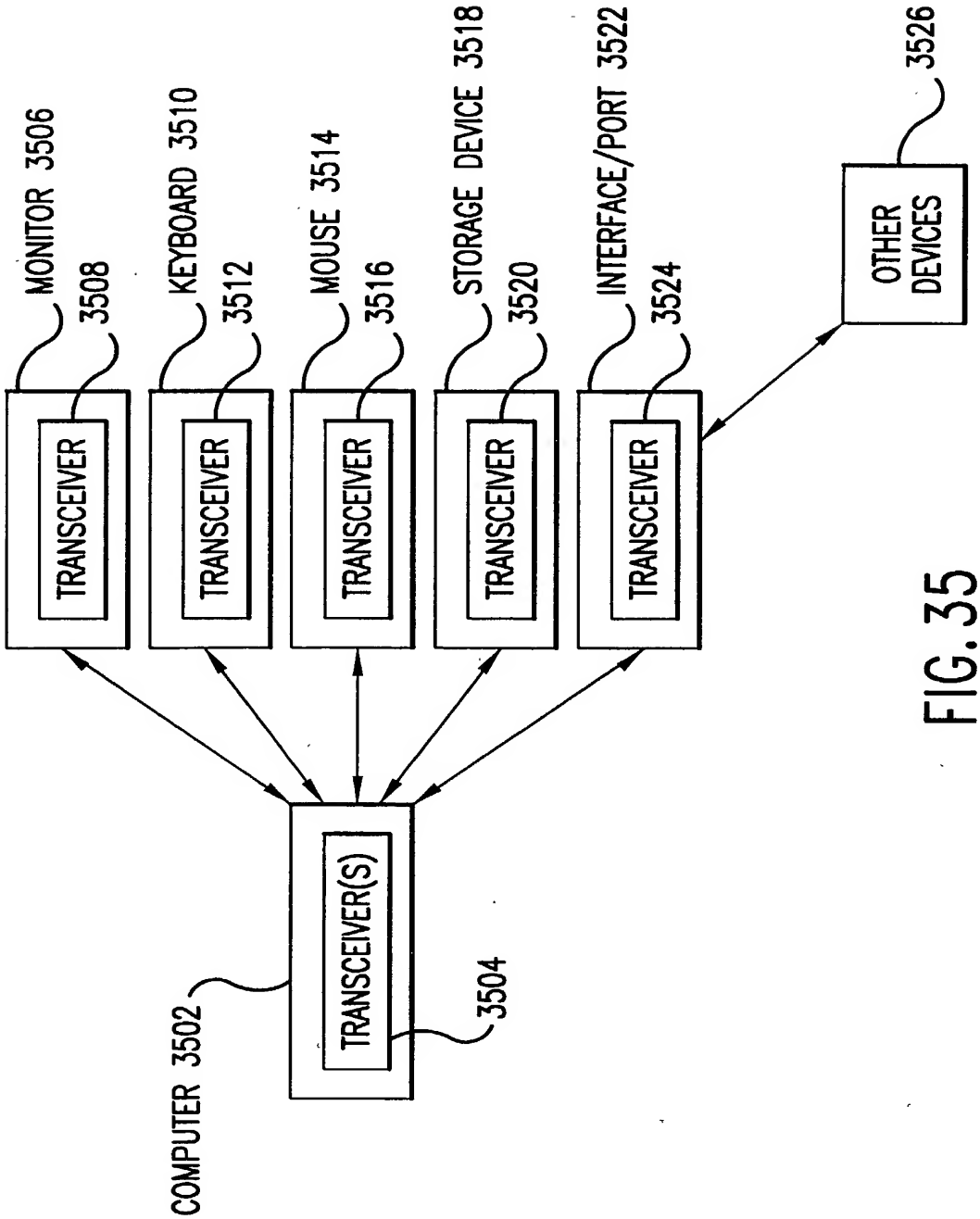
MONITOR 3506
3508
KEYBOARD 3510
3512
MOUSE 3514
3516
STORAGE DEVICE 3518
3520
INTERFACE/PORT 3522
3524
3526
OTHER DEVICES
TRANSCEIVER
TRANSCEIVER
TRANSCEIVER
TRANSCEIVER
TRANSCEIVER
TRANSCEIVER(S)
3504
COMPUTER 3502

FIG. 35

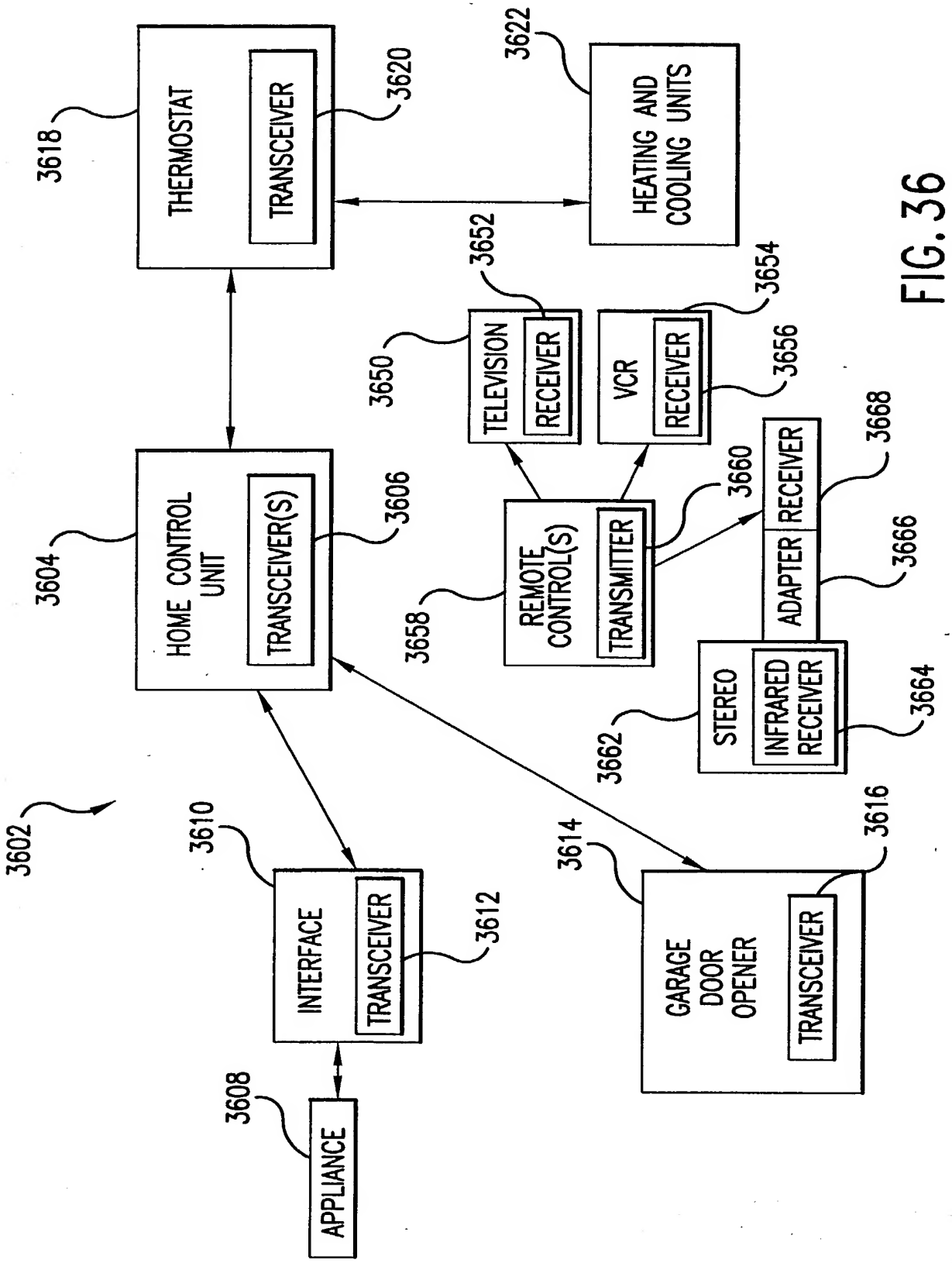
3602
3604
HOME CONTROL UNIT
TRANSCEIVER(S)
3606
3608
APPLIANCE
3610
INTERFACE
TRANSCEIVER
3612
3614
GARAGE DOOR OPENER
TRANSCEIVER
3616
3618
THERMOSTAT
TRANSCEIVER
3620
3622
HEATING AND COOLING UNITS
3650
TELEVISION
RECEIVER
3652
3654
VCR
RECEIVER
3656
3658
REMOTE CONTROL(S)
TRANSMITTER
3660
3662
STEREO
INFRARED RECEIVER
3664
3666
ADAPTER
RECEIVER
3668

FIG. 36

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Inventors Sorrells *et al* , Tel 202/371-2600
Title Applications of Universal Frequency Translation

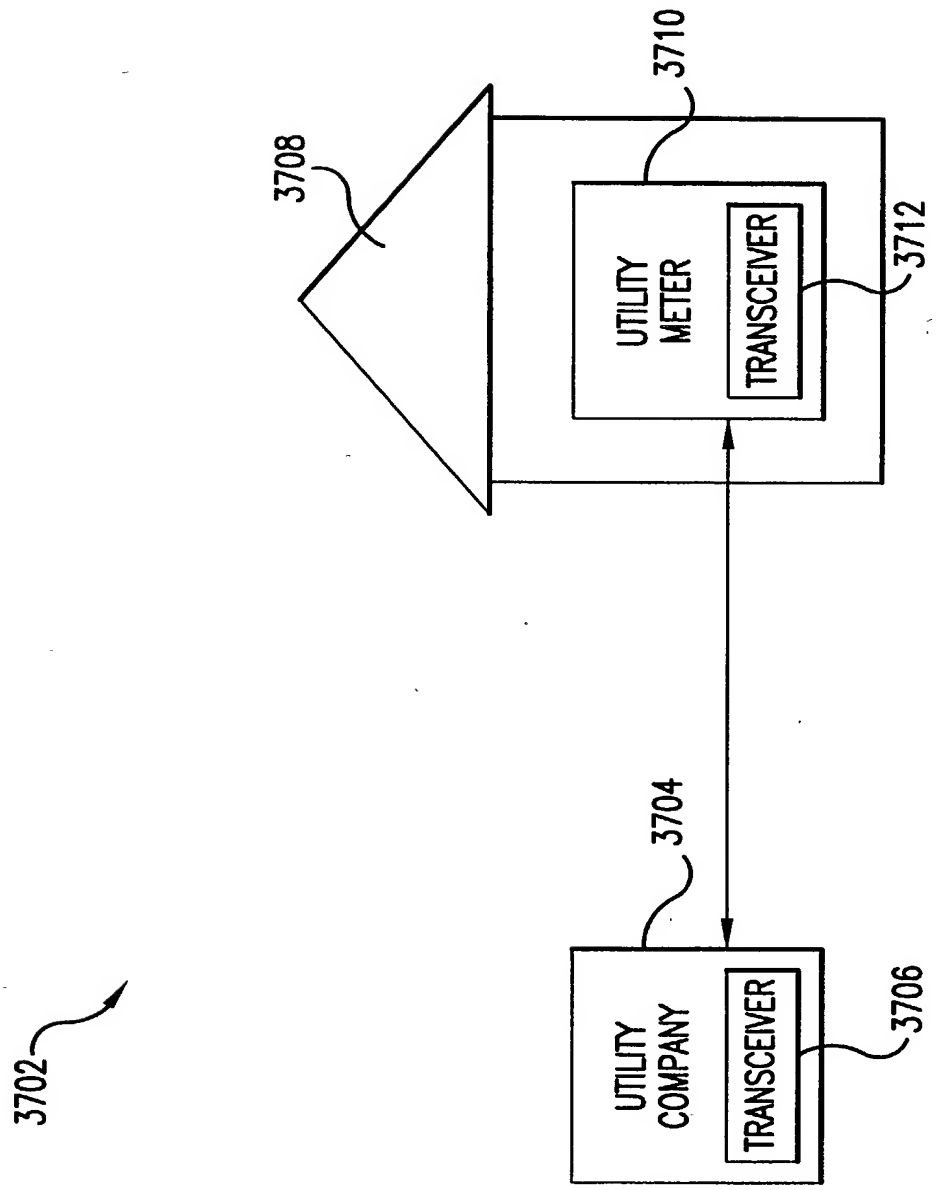

FIG. 37

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Dkt No 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al* , Tel 202/371-2600
Title Applications of Universal Frequency Translation

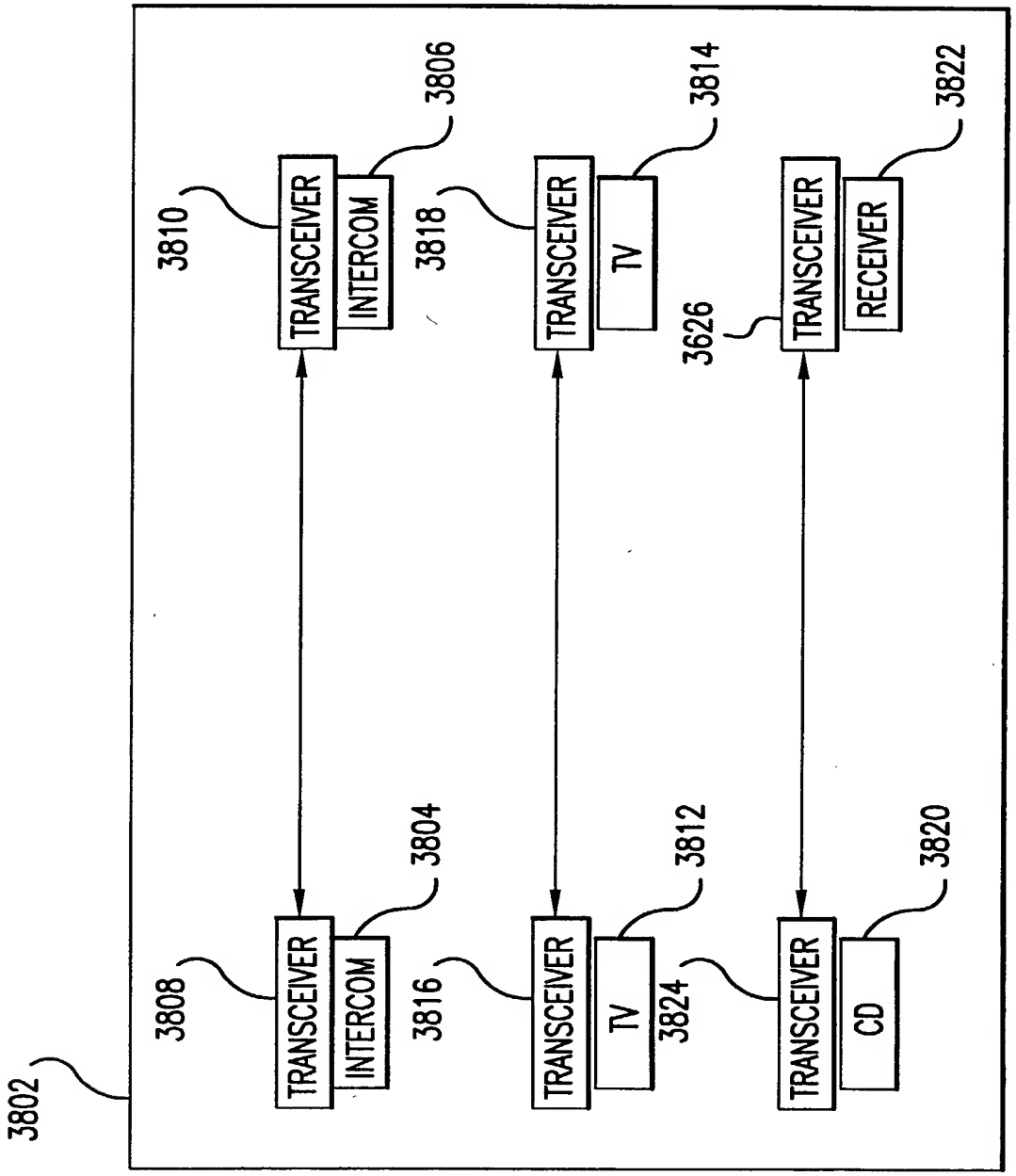

FIG. 38

3902
3904
INTERFACE
TRANSCEIVER
3906A
3906B
TRANSCEIVER
DOOR LOCK
3908
3906C
3910
TRANSCEIVER
CONTROLLER
3906D
TRANSCEIVER
GASOLINE PUMP
3912
3906E
TRANSCEIVER
KEYLESS ENTRY DEVICE
3914
3906F
TRANSCEIVER
TOLL BOOTH
3916
3906G
TRANSCEIVER
CONTROL UNIT
3918

FIG. 39

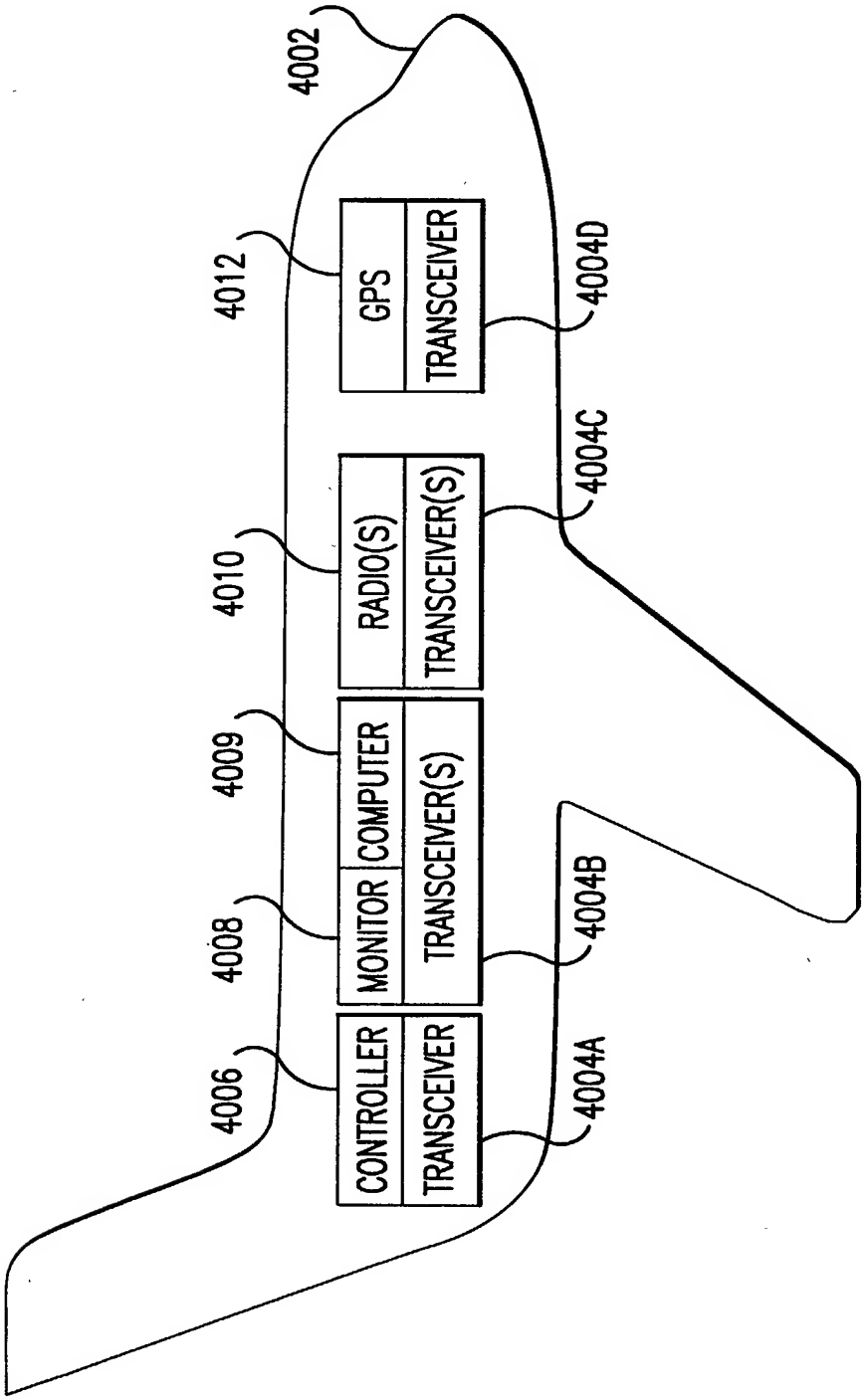
4002
4012
GPS
TRANSCEIVER
4004D
4010
RADIO(S)
TRANSCEIVER(S)
4004C
4009
COMPUTER
4008
MONITOR
TRANSCEIVER(S)
4004B
4006
CONTROLLER
TRANSCEIVER
4004A

FIG. 40A

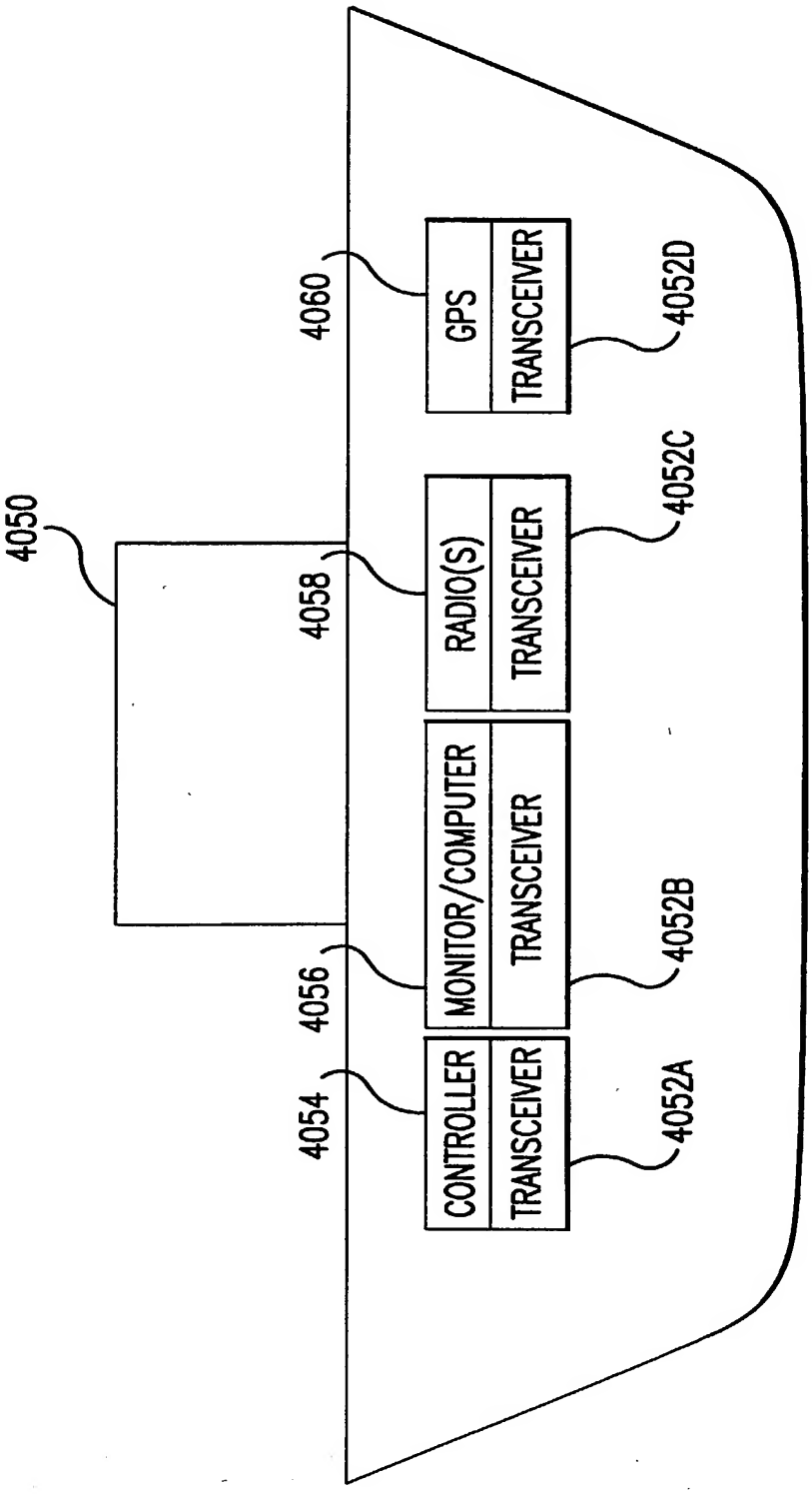
4050
4052A
4052B
4052C
4052D
4054
4056
4058
4060
CONTROLLER
TRANSCEIVER
MONITOR/COMPUTER
TRANSCEIVER
RADIO(S)
TRANSCEIVER
GPS
TRANSCEIVER

FIG. 40B

Appl No 10/086,250, Filed March 4, 2002
Dkt No 1744 0140006; Group Art Unit 2681
Inventors Sorrells *et al* , Tel 202/371-2600
Title Applications of Universal Frequency Translation

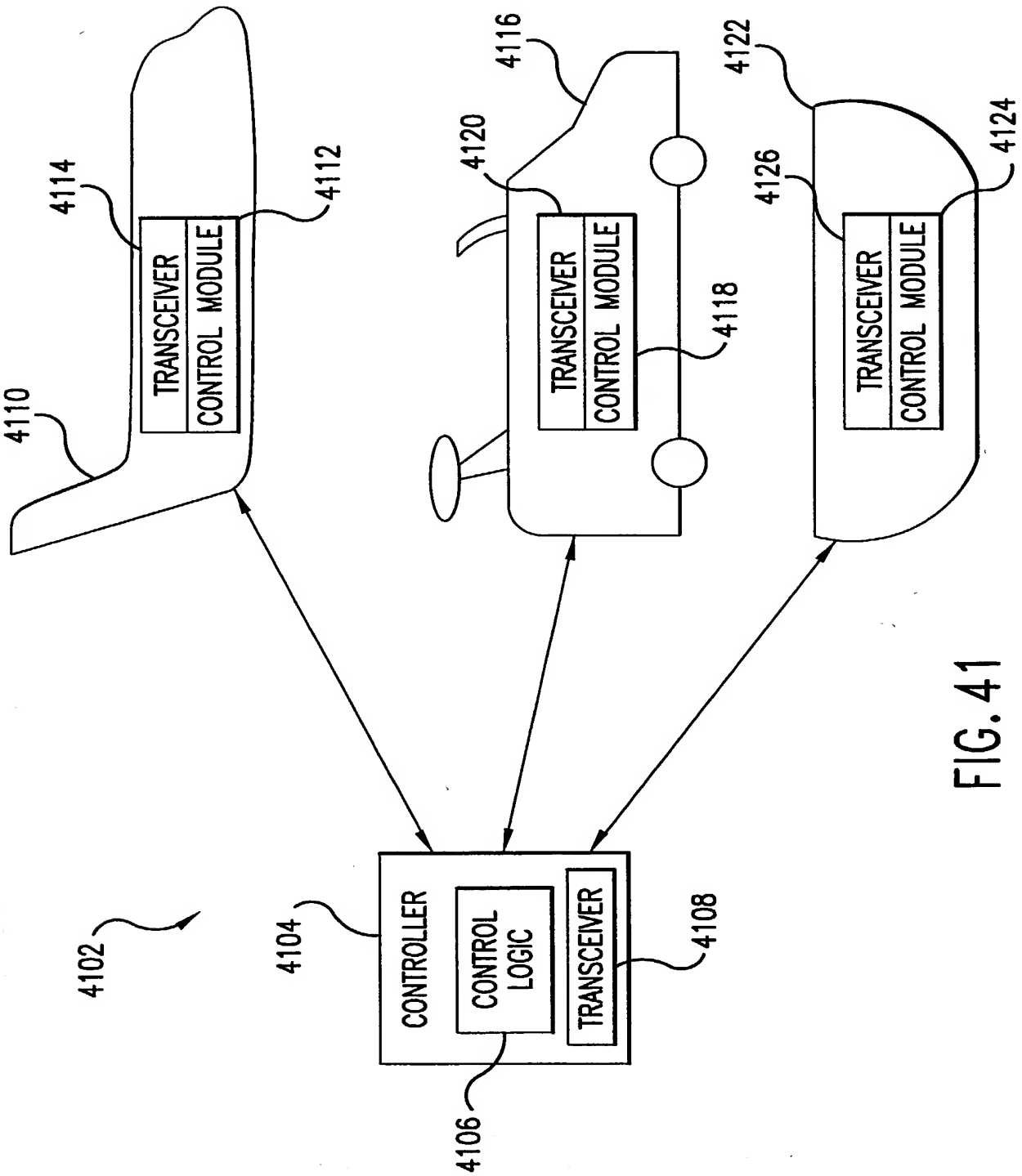

FIG. 41

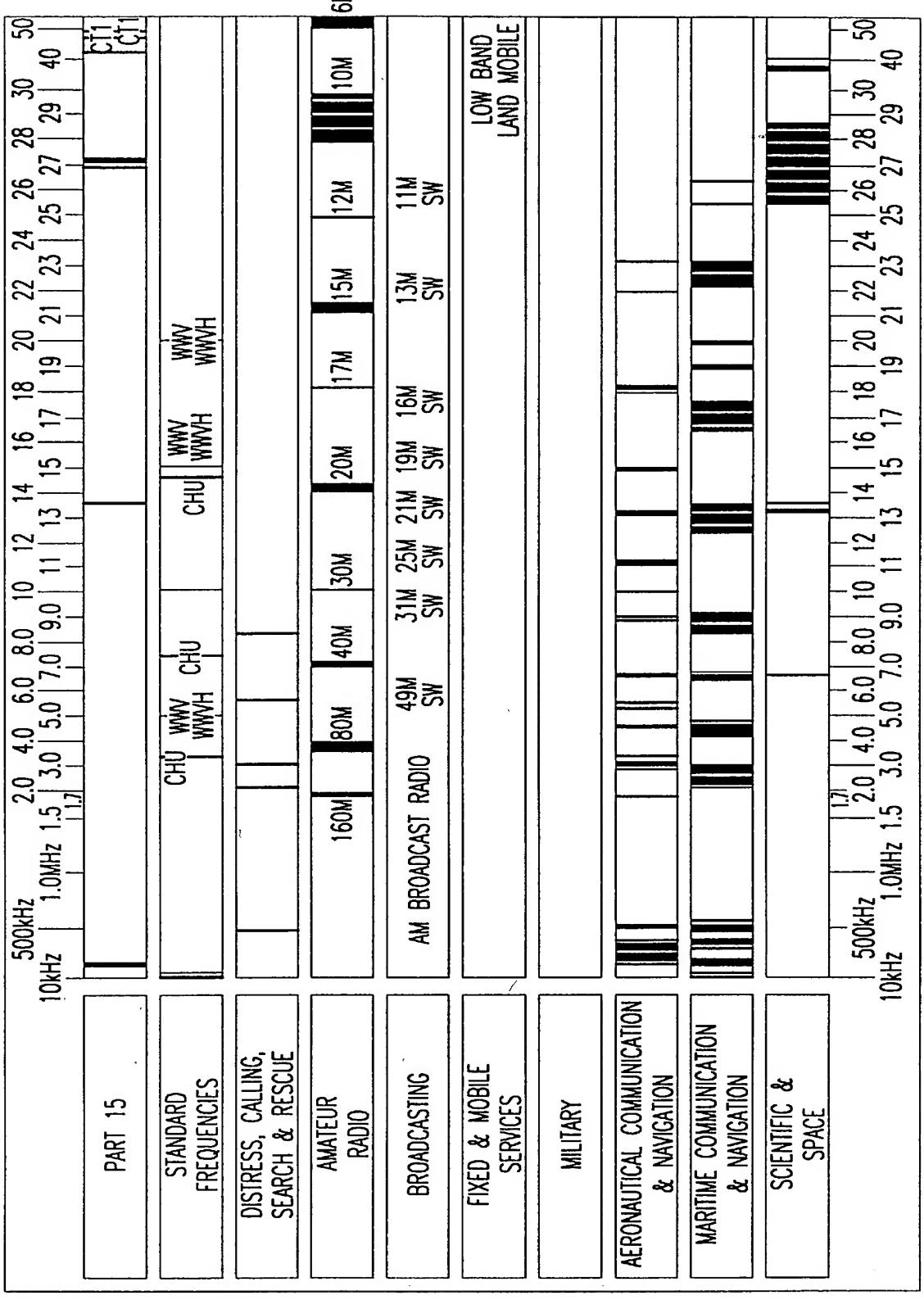
10kHz
500kHz
1.0MHz
1.5
1.7
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
40
50
PART 15
CT1
CT1
STANDARD FREQUENCIES
CHU
WWV
WWVH
CHU
CHU
WWV
WWVH
WWV
WWVH
DISTRESS, CALLING, SEARCH & RESCUE
AMATEUR RADIO
160M
80M
40M
30M
20M
17M
15M
12M
10M
6M
BROADCASTING
AM BROADCAST RADIO
49M SW
31M SW
25M SW
21M SW
19M SW
16M SW
13M SW
11M SW
FIXED & MOBILE SERVICES
LOW BAND LAND MOBILE
MILITARY
AERONAUTICAL COMMUNICATION & NAVIGATION
MARITIME COMMUNICATION & NAVIGATION
SCIENTIFIC & SPACE

FIG. 42A

Appl No 10/086,250, Filed March 4, 2002
Dkt No 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al*, Tel 202/371-2600
Title Applications of Universal Frequency Translation

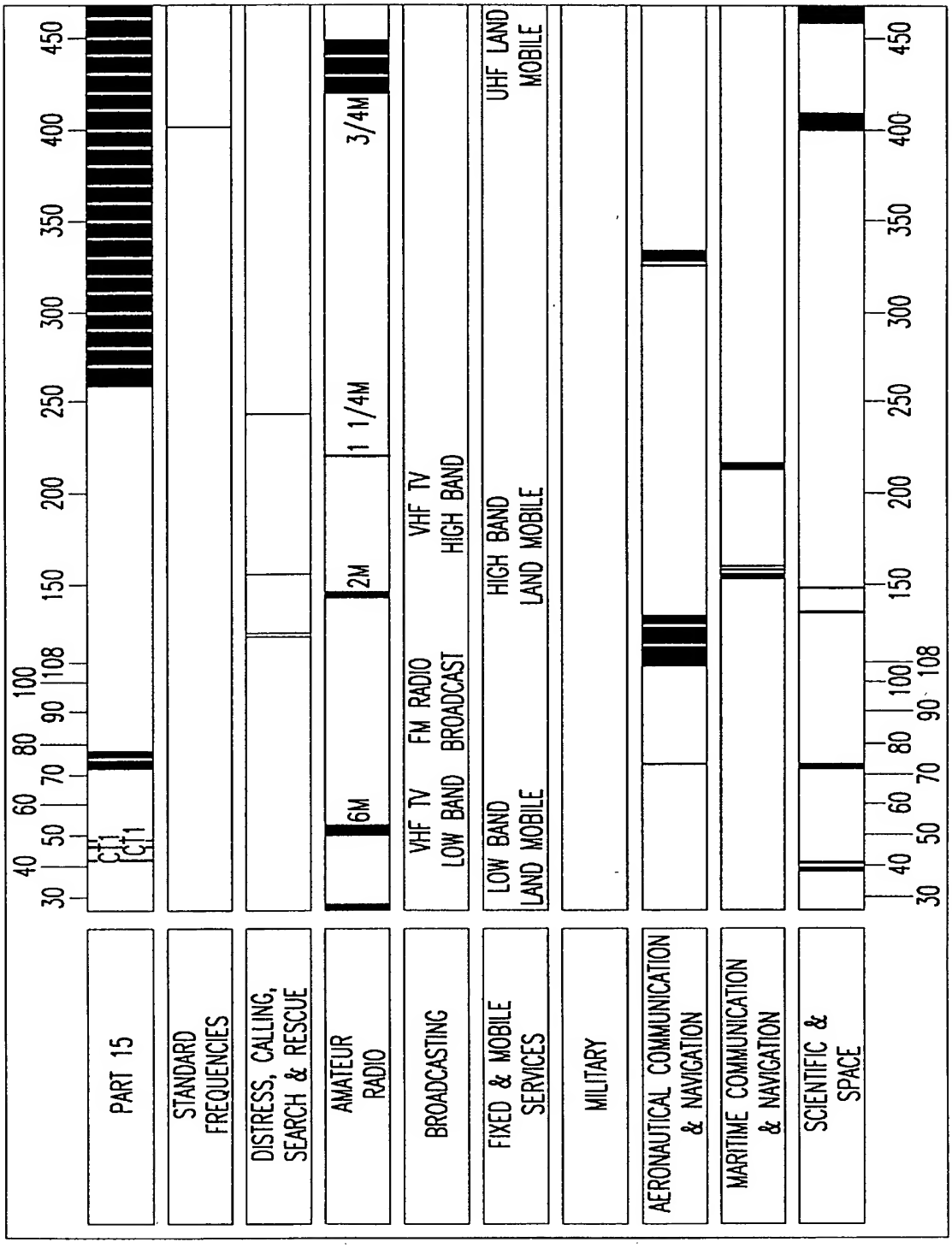

FIG. 42B

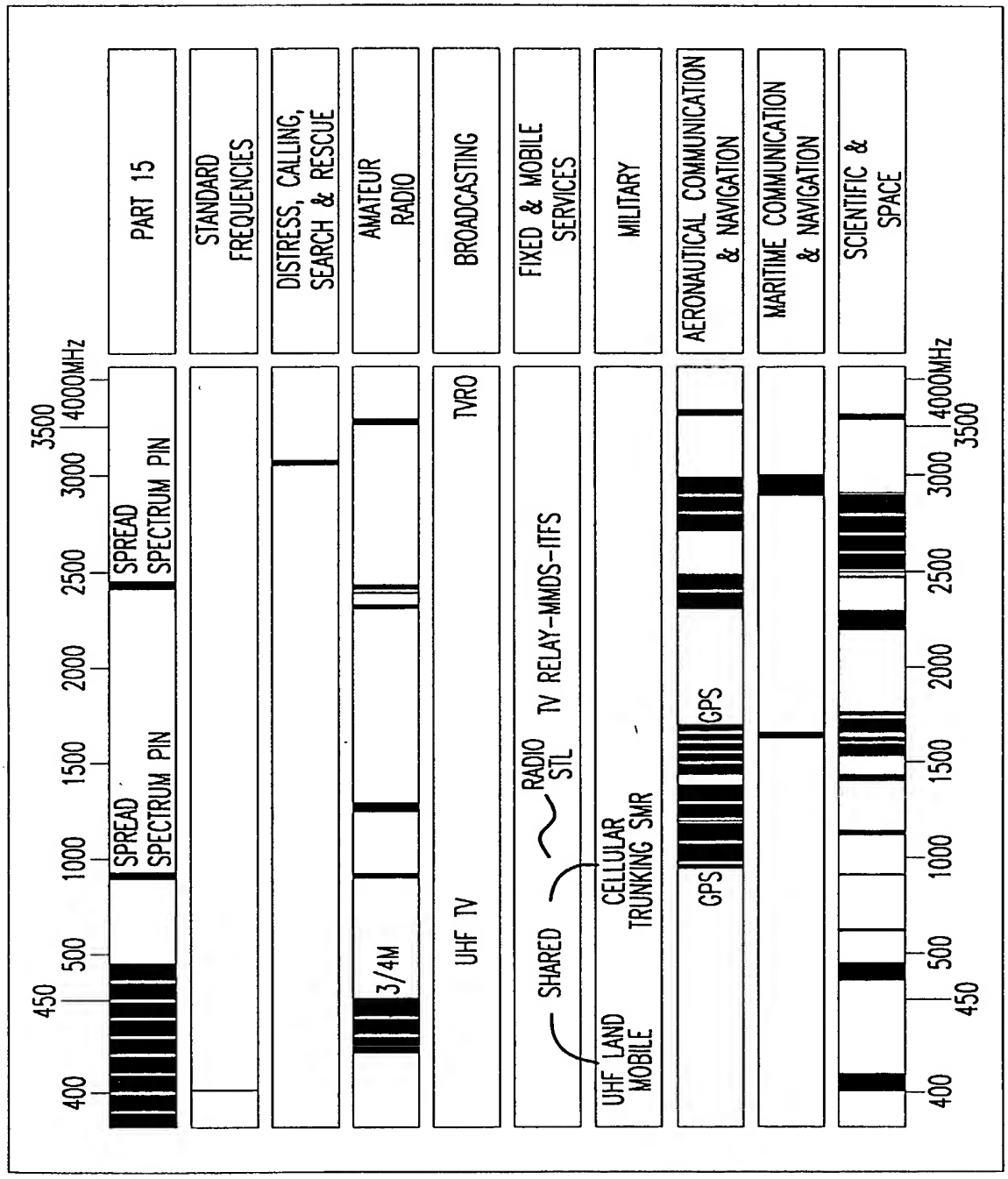
PART 15
STANDARD FREQUENCIES
DISTRESS, CALLING, SEARCH & RESCUE
AMATEUR RADIO
BROADCASTING
FIXED & MOBILE SERVICES
MILITARY
AERONAUTICAL COMMUNICATION & NAVIGATION
MARITIME COMMUNICATION & NAVIGATION
SCIENTIFIC & SPACE
400
450
500
1000
1500
2000
2500
3000
3500
4000MHz
SPREAD SPECTRUM PIN
SPREAD SPECTRUM PIN
3/4M
UHF TV
TVRO
SHARED
RADIO STL
TV RELAY-MMDS-ITFS
UHF LAND MOBILE
CELLULAR TRUNKING SMR
GPS
GPS

FIG. 42C

Appl No 10/086,250, Filed March 4, 2002
Dkt No 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al.*, Tel 202/371-2600
Title Applications of Universal Frequency Translation

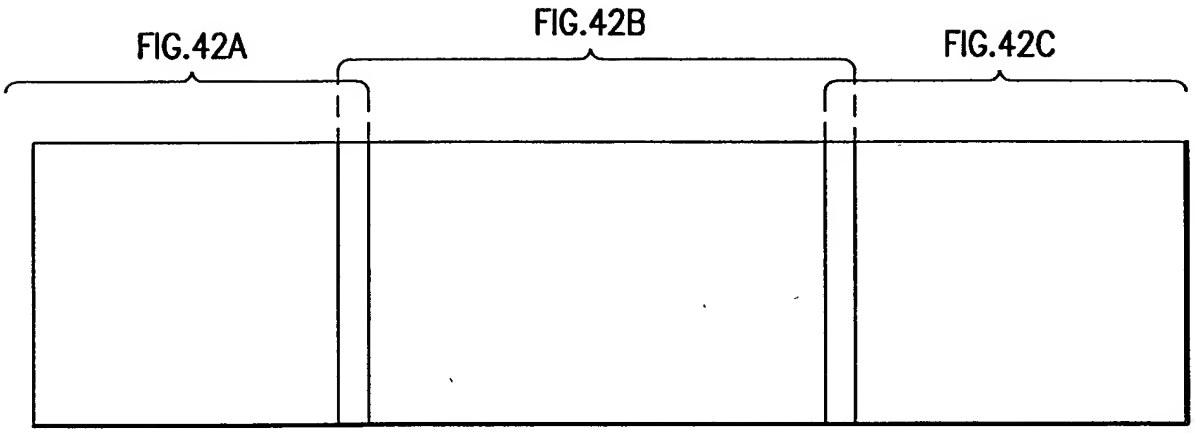

FIG. 42D

Appl No 10/086,250, Filed March 4, 2002
Dkt No 1744 0140006, Group Art Unit 2681
Inventors Sorrells *et al.*, Tel 202/371-2600
Title Applications of Universal Frequency Translation

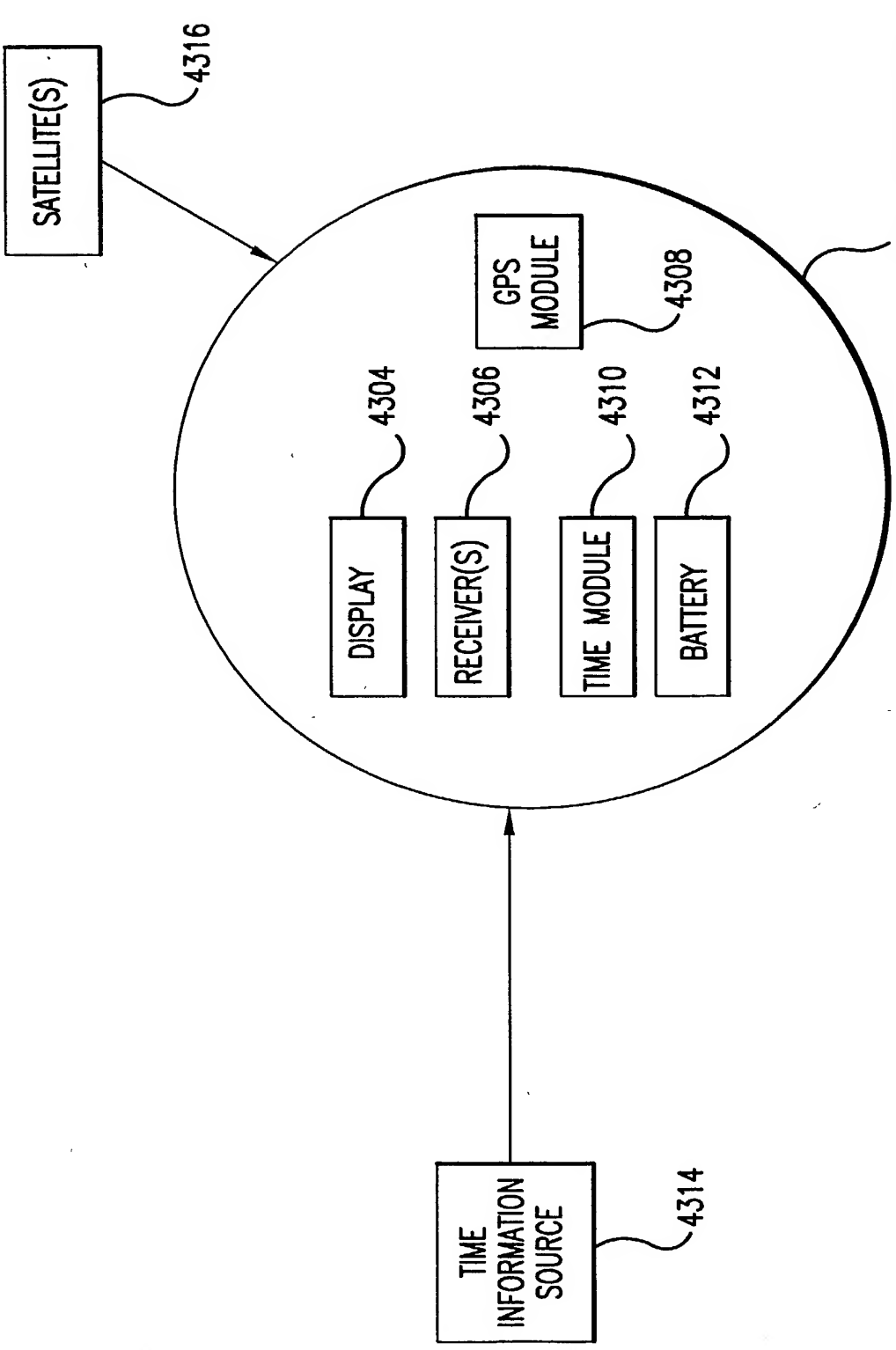

FIG. 43

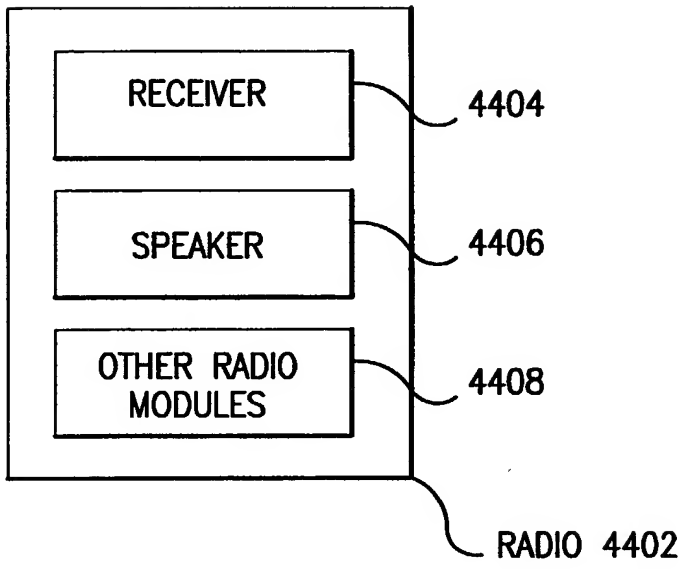
RECEIVER
4404
SPEAKER
4406
OTHER RADIO MODULES
4408
RADIO 4402

FIG. 44